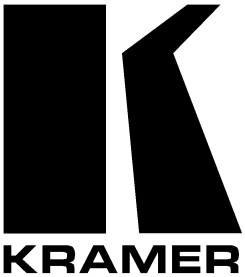
# Kramer Electronics, Ltd.




# USER MANUAL

## Model:

**VS-3232Vxl**

***32x32 Video Matrix Switcher***

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# 1 Introduction

Welcome to Kramer Electronics (since 1981): a world of unique, creative and affordable solutions to the infinite range of problems that confront the video, audio and presentation professional on a daily basis. In recent years, we have redesigned and upgraded most of our line, making the best even better! Our 500-plus different models now appear in 8 Groups[1], which are clearly defined by function.

Congratulations on purchasing your Kramer **VS-3232Vxl** *32x32 Video Matrix Switcher*. This product is ideal for the following typical applications:

- Professional display systems requiring video signal routing
- Broadcast, presentation and production facilities, as well as monitoring in large duplication systems
- Rental/staging applications

The package includes the following items:

- **VS-3232Vxl** *32x32 Video Matrix Switcher*
- Power cord and null-modem adapter
- Windows®-based Kramer control software[2]
- Windows®-based Ethernet Configuration Manager and Virtual Serial Port Manager
- Kramer **RC-IR2** Infra-red remote control transmitter (including the required batteries and a separate user manual[3]) and this user manual[3]

# 2 Getting Started

We recommend that you:

- Unpack the equipment carefully and save the original box and packaging materials for possible future shipment
- Review the contents of this user manual
- Use Kramer high performance high resolution cables[4]

## 2.1 Quick Start

This quick start chart summarizes the basic setup and operation steps.

1 GROUP 1: Distribution Amplifiers; GROUP 2: Video and Audio Switchers, Matrix Switchers and Controllers; GROUP 3: Video, Audio, VGA/XGA Processors; GROUP 4: Interfaces and Sync Processors; GROUP 5: Twisted Pair Interfaces; GROUP 6: Accessories and Rack Adapters; GROUP 7: Scan Converters and Scalers; and GROUP 8: Cables and Connectors

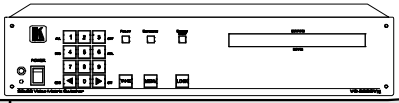
2 Downloadable from our Web site at http://www.kramerelectronics.com

3 Download up-to-date Kramer user manuals from our Web site: http://www.kramerelectronics.com

4 The complete list of Kramer cables is on our Web site at http://www.kramerelectronics.com

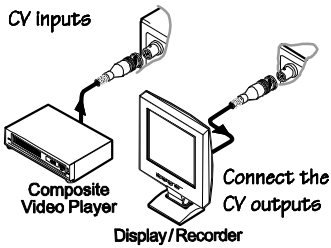
## Step 1: Mount the machine - see section 5

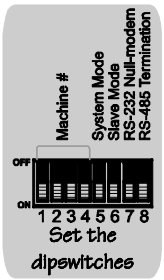
Mount the machine in a rack or
stick the 4 rubber feet to the underside

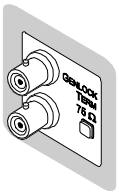


## Step 2: Connect the inputs and outputs - see section 6

Connect the
CV inputs




To connect a multi-channel switcher:
- Combine 2 units for an s-Video switcher
- Combine 3 units for a YUV/RGB switcher
- Combine 4 units for an RGBS switcher

Select the Sync input from:
- An external sync (GENLOCK)
- IN # 1
- An external system

Or no Sync

## Step 3: Connect the control port - see section 6

If required, connect an RS-232 Control Port, an RS-485 port and/or the ETHERNET Port

## Step 4: Turn the power ON

## Step 5: Use the configuration menu - see section 8

Use the MENU, ►, ◄ and digit buttons to set the configuration via the menu:

| | |
|---|---|
| **SYNC Configuration:** | noVIS, INT#1, EXT-BNC, EXT-SYS |
| **INTERFACE Configuration:** | RS485, IRremote, Ethernet |
| **Interface REPLY Configuration:** | REPLY ON, never REPLY |
| **PROTOCOL Configuration:** | KRAMER 2000, ASCII |
| **DEFAULT Setup Configuration:** | setup+crosepnte, crosepnte, setup |
| **Store DEFAULT Setup** | |
| **TOTAL RESET:** | All outputs OFF, Factory default |
| **Firmware Version:** | Current firmware version |

## Step 6: Operate the machine - see section 7

Operate via the front panel buttons, IR remote control, RS-485, RS-232, and ETHERNET

# 3 Overview

The Kramer **VS-3232Vxl** is a very high performance, superior 32x32 vertical interval matrix switcher for composite video signals on BNC connectors. It features a video bandwidth of over 500MHz that ensures transparent performance even in the most critical applications. Three SYNC switching options make the **VS-3232Vxl** appropriate for a wide range of glitch-free transition applications. The **VS-3232Vxl** can be used as a standalone unit, or configured as a part of a multi-signal Kramer switcher system, in which all units switch simultaneously.

The **VS-3232Vxl** features:

- Full 32x32 non-blocking matrix array to switch any of the 32 input video signals to any or all outputs
- A video bandwidth of over 500MHz at 3dB along with 0.1dB flatness to 50MHz
- Four switching options, one for immediate switching and three for SYNC switching
- 59 preset memory locations for quick access to user-defined special configurations
- Fast access to a preprogrammed default preset configuration (UNITY setting)
- Two communication protocols – the Kramer 2000 and the limited Sierra ASCII
- Easy upgrading of the firmware via the Internet
- An 80x2 symbol LCD panel with user-friendly information and a configuration menu
- Optional connection to several switchers in one multi-signal video-audio control system
- A LOCK button/remote function to prevent tampering with the front panel

Control the **VS-3232Vxl** via the front panel buttons, or:

- Remotely, by RS-232 or RS-485 serial commands transmitted by a touch screen system, PC, or other serial controller
- Via the ETHERNET
- Via the infra-red remote control transmitter
- Via an external remote IR Receiver (optional), see section 4.1

The **VS-3232Vxl** is housed in a 19" 2U rack mountable enclosure.

To achieve the best performance:

- Connect only good quality connection cables, thus avoiding interference, deterioration in signal quality due to poor matching, and elevated noise levels (often associated with low quality cables)
- Avoid interference from neighboring electrical appliances that may adversely influence signal quality and position your Kramer **VS-3232Vxl** in a location free from moisture and away from excessive sunlight and dust

# 4 Your Video Matrix Switcher

Figure 1 and Figure 2 illustrate the front and rear panels of the **VS-3232Vxl**, respectively. Table 1 and Table 2 define the front and rear panels of the **VS-3232Vxl**, respectively.

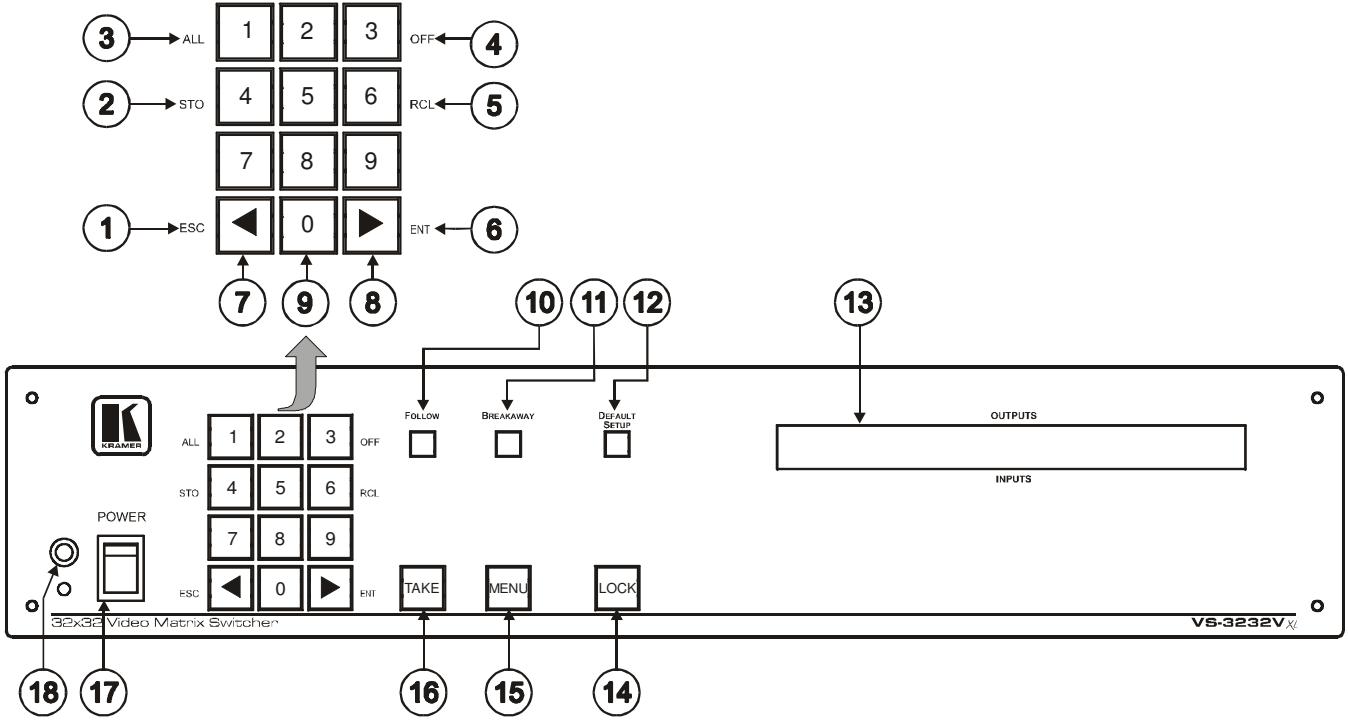



*Figure 1: VS-3232Vxl 32x32 Video Matrix Switcher Front Panel*

*Table 1: Front Panel VS-3232Vxl 32x32 Video Matrix Switcher Features*

| # | Feature | | | Function |
|---|---|---|---|---|
| 1 | Double-function Selector Buttons Area | Menu Buttons | *ESC* | Press to exit the current operation |
| 2 | | | *STO*[1] | Press to store the current setting in the non-volatile memory |
| 3 | | | *ALL*[1] | Press *ALL* followed by an input number to connect that input to all the outputs |
| 4 | | | *OFF*[1] | Press OFF followed by an output number to disconnect that output |
| 5 | | | *RCL*[1] | Press to recall a setup from the non-volatile memory |
| 6 | | | *ENT* | Press to complete the input-output setup when using a one-digit number instead of two digits[2].<br>Press to enter the options in a setup menu |
| 7 | | Button Labels | ► (Forward) | Press to shift the content of the display to the left[3] |
| 8 | | | ◄ (Backward) | Press to shift the content of the display to the right[3] |
| 9 | | | Digits from 0 to 9 | Select the output to which the input is switched and select the input to switch to the output |
| 10 | *FOLLOW* Button | | | Press to enter the Follow mode in the multi-switcher configuration |
| 11 | *BREAKAWAY* Button | | | Press to enter the Stand-Alone mode in the multi-switcher configuration |
| 12 | *DEFAULT SETUP* Button | | | Press to recall the default setup (UNITY setting), see section 8.5 |
| 13 | *INPUTS/OUTPUTS* LCD Display | | | Displays the outputs (in the upper row, below the OUTPUTS label) switched to the selected inputs (in the lower row, above the INPUTS label).<br>Displays user interface messages and configuration menu items |
| 14 | *LOCK* Button | | | Toggle[4] to lock/unlock the front panel buttons |
| 15 | *MENU* Button | | | Press once to enable the ALL, OFF STO and RCL buttons<br>Press twice to enter the configuration menu<br>When in the configuration menu, press to browse through the menu items |
| 16 | *TAKE* Button | | | Used to confirm and complete setup and switching |
| 17 | Power Switch | | | Illuminated switch for turning the unit ON or OFF |
| 18 | IR Receiver | | | The red LED is illuminated when receiving signals from the Kramer Infra-red remote control transmitter |

1 This button is enabled and illuminated after pressing the MENU button

2 For example, to enter input 5, you can either press 0, 5 or 5, ENT

3 Since the LCD display is large enough to show only 13 cross-points out of a total of 32

4 Press and hold the LOCK button for about two seconds to toggle

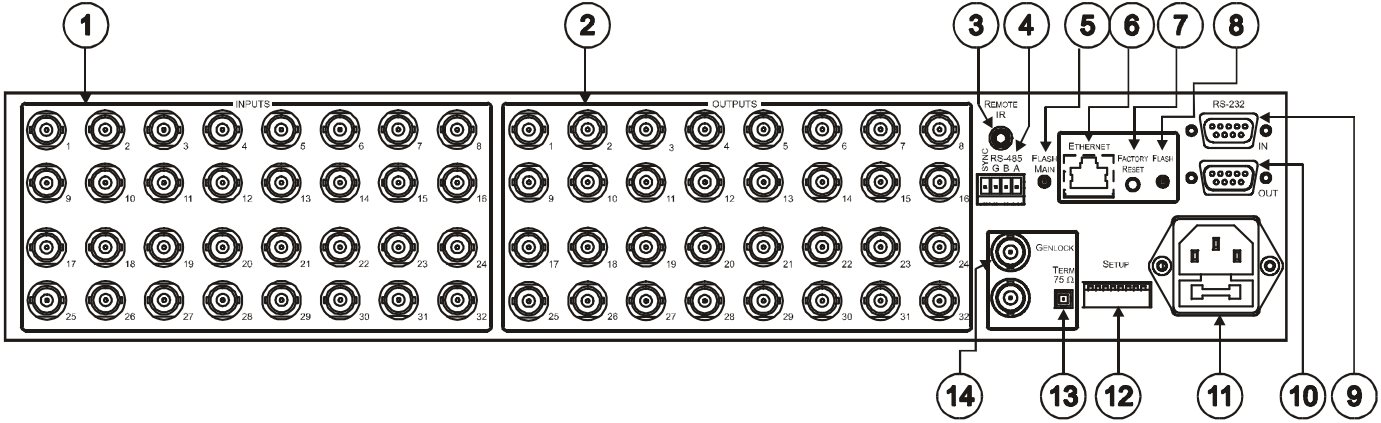



*Figure 2: VS-3232Vxl 32x32 Video Matrix Switcher Rear Panel*

*Table 2: Rear Panel VS-3232Vxl 32x32 Video Matrix Switcher Features*

| # | Feature | | Function |
|---|---|---|---|
| 1 | *INPUT* BNC Connectors | | Connect to the video sources (from 1 to 32) |
| 2 | *OUTPUT* BNC Connectors | | Connect to the video acceptors (from 1 to 32) |
| 3 | *REMOTE IR* Opening[1] | | Connects to an external IR receiver unit[2] for controlling the machine via an IR remote controller (instead of using the front panel IR receiver) |
| 4 | *RS-485* Detachable Terminal Block Port | | The SYNC and the G PINs are for vertical sync and ground connection respectively, and the B and A PINs are for RS-485 |
| 5 | *FLASH MAIN* Button | | Push in[3] to upgrade the switcher microcontroller to the latest Kramer firmware (see section 9.1), or release (the factory default) for normal operation |
| 6 | *ETHERNET* Connector | | Connects to the PC or other Serial Controller through computer networking LAN |
| 7 | *FACTORY RESET* Button | | Press to reset to factory default definitions[4]:<br>IP Address: 192.168.1.39<br>Mask: 255.255.255.0<br>Gateway: 192.168.1.1 |
| 8 | *FLASH – Normal* Switch | | Push in[3] to upgrade the ETH FLASH firmware version (see section 9.2), or release (the factory default) for normal operation |
| 9 | *RS-232* | *IN* DB 9F Port | Connects to the PC or the Remote Controller[5] |
| 10 | | *OUT* DB 9M Port | Connects to the RS-232 IN DB 9F port of the next unit in the daisy-chain connection |
| 11 | Power Connector with Fuse | | AC connector enabling power supply to the unit |
| 12 | *SETUP* Dipswitches | | Dipswitches for setup of the unit (see section 6.2.3) |
| 13 | *TERM 75Ω* Button | | Press to terminate the GENLOCK SYNC with 75 Ω or release for looping[6] |
| 14 | GENLOCK Double BNC Connectors | | For GENLOCK SYNC input/loop |

1 Covered by a cap. The 3.5mm connector at the end of the internal IR connection cable fits through this opening

2 Optional. Can be used instead of the front panel (built-in) IR receiver to remotely control the machine (only if the internal IR connection cable has been installed)

3 Using a small screwdriver if required

4 Turn the machine OFF using the power switch and then turn it ON while pressing the ETH Factory Reset button. The unit will power up and load its memory with the factory default definitions

5 If the unit is not the first unit in the line, connects to the RS-232 OUT DB 9F port of the previous unit in the line

6 Push in to terminate the sync line. Push out when the sync line extends to another unit

## 4.1 Using the IR Transmitter

You can use the **RC-IR2** IR transmitter to control the machine via the built-in IR receiver on the front panel or, instead, via an optional external IR receiver[1]. The external IR receiver can be located up to 15 meters away from the machine. This distance can be extended to up to 60 meters when used with three extension cables[2].

Before using the external IR receiver, be sure to arrange for your Kramer dealer to insert the internal IR connection cable[3] with the 3.5mm connector that fits into the REMOTE IR opening on the rear panel.

Connect the external IR receiver to the REMOTE IR 3.5mm connector.

1 Model: C-A35M/IRR-50

2 Model: C-A35M/A35F-50

3 P/N: 505-70434010-S

# 5 Installing the VS-3232Vxl on a Rack

This section describes what to do before installing on a rack and how to rack mount.

**Before Installing on a Rack**

| Before installing on a rack, be sure that the environment is within the recommended range: | |
|---|---|
| Operating temperature range | +5 to +45 Deg. Centigrade |
| Operating humidity range | 5 to 65% RHL, non-condensing |
| Storage temperature range | -20 to +70 Deg. Centigrade |
| Storage humidity range | 5 to 95% RHL, non-condensing |

**CAUTION!!**

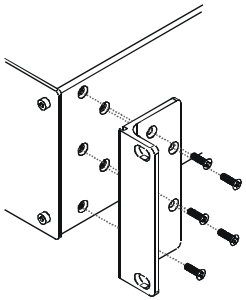
When installing on a 19" rack, avoid hazards by taking care that:

1. It is located within the recommended environmental conditions, as the operating ambient temperature of a closed or multi unit rack assembly may exceed the room ambient temperature.
2. Once rack mounted, enough air will still flow around the machine.
3. The machine is placed straight in the correct horizontal position.
4. You do not overload the circuit(s). When connecting the machine to the supply circuit, overloading the circuits might have a detrimental effect on overcurrent protection and supply wiring. Refer to the appropriate nameplate ratings for information. For example, for fuse replacement, see the value printed on the product label.
5. The machine is earthed (grounded) in a reliable way and is connected only to an electricity socket with grounding. Pay particular attention to situations where electricity is supplied indirectly (when the power cord is not plugged directly into the socket in the wall), for example, when using an extension cable or a power strip, and that you use only the power cord that is supplied with the machine.

**How to Rack Mount**

To rack-mount a machine:

1. Attach both ear brackets to the machine. To do so, remove the screws from each side of the machine (5 on each side), and replace those screws through the ear brackets.



2. Place the ears of the machine against the rack rails, and insert the proper screws (not provided) through each of the four holes in the rack ears.

Note that:

- **In some models, the front panel may feature built-in rack ears**
- Detachable rack ears can be removed for desktop use
- Always mount the machine in the rack before you attach any cables or connect the machine to the power
- If you are using a Kramer rack adapter kit (for a machine that is not 19"), see the Rack Adapters user manual for installation instructions (you can download it at: http://www.kramerelectronics.com)

# 6 Connecting the Video Matrix Switcher

You can install the **VS-3232Vxl** as:

- A composite video standalone switcher (see section 6.1)
- An s-Video switcher, by combining two **VS-3232Vxl** switchers: one unit for the Y signal and the second unit for the C signal (see section 6.2.1)
- A component video (YUV/RGB) switcher, by combining three **VS-3232Vxl** units: one for the Y signal, the second for the U signal and the third for the V signal (see section 6.2.2)
- An RGBS switcher, by combining four **VS-3232Vxl** units: one for the R signal, the second for the G signal, the third for the B signal and the fourth for the SYNC (see section 6.2.3)

## 6.1 Connecting the VS-3232Vxl as a Composite Video Switcher

To install the **VS-3232Vxl** as illustrated in the example in Figure 3, do the following[1]:

1. Connect up to 32 composite video sources (for example[2], two composite video players).
2. Connect up to 32 composite video acceptors (for example[2], two displays).
3. Set the dipswitches (see section 6.2.3).
4. If required, connect a PC and/or controller to the RS-232 port (see section 6.4.1) and/or the RS-485 port (see section 6.4.2) and/or the ETHERNET port (see section 6.6).
5. Connect the power cord[3].
6. If necessary, review and set the system variables, using the MENU function, and the default setup (UNITY setting) as section 8 describes.

1 Switch OFF the power on each device before connecting it to your VS-3232Vxl

2 In this example only two inputs and two outputs are connected

3 We recommend that you use only the power cord that is supplied with this machine

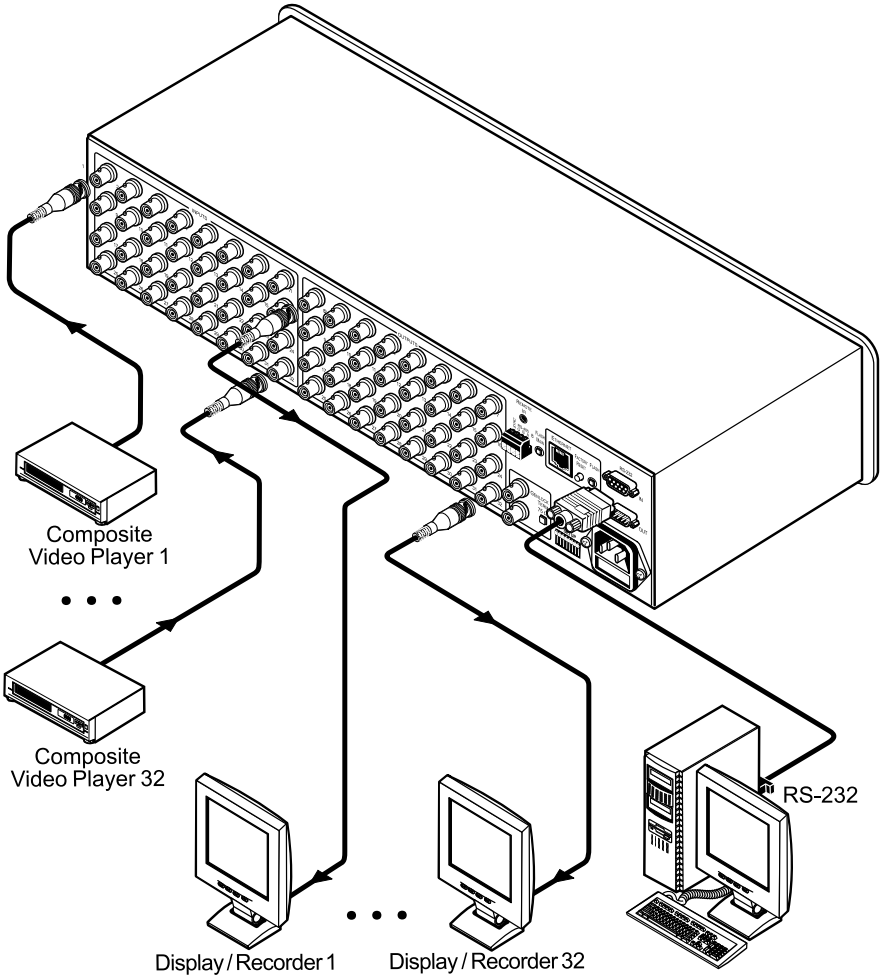



*Figure 3: Configuring the VS-3232Vxl for Composite Video*

## 6.2 Assembling a Multi-channel Video Switcher

You can configure several **VS-3232Vxl** units as 32x32 multi-channel video switchers for:

- s-Video (Y/C) by combining two **VS-3232Vxl** units (see section 6.2.1)
- YUV (RGB) by combining three **VS-3232Vxl** units (see section 6.2.2)
- RGBS by combining four **VS-3232Vxl** units (see section 6.2.3)

In a multi-channel video switcher configuration, only one unit can be the Master (with DIP 6 OFF). The other units must be Slaves (with DIP 6 ON).

The front panel of each Slave unit is always locked and its LCD display does not illuminate, although it displays the current cross-point status of those switchers. The Slave units always follow the Master. The Master unit operates in the regular way[1], leading the Slaves in the background.

To activate a multi-channel video switcher so that each unit is in the same state from the outset, first turn ON the master unit and only after it completes the initial setup, turn ON the slave units one by one.

1 The front panel is not locked and the LCD display illuminates

### 6.2.1 Configuring a 32x32 Y/C Switcher (Two Units)

You can configure a 32x32 video matrix switcher for s-Video (Y/C), by combining two **VS-3232Vxl** switchers. Note that the machine number on both units must be identical.

Although in the example in Figure 4 only one input[1] and one output[2] are connected, you can connect all the inputs and outputs in the same way to create a 32x32 Y/C switcher.

Connect the communication line between the two switchers via the RS-232 or RS-485 control interface as section 6.4 describes.

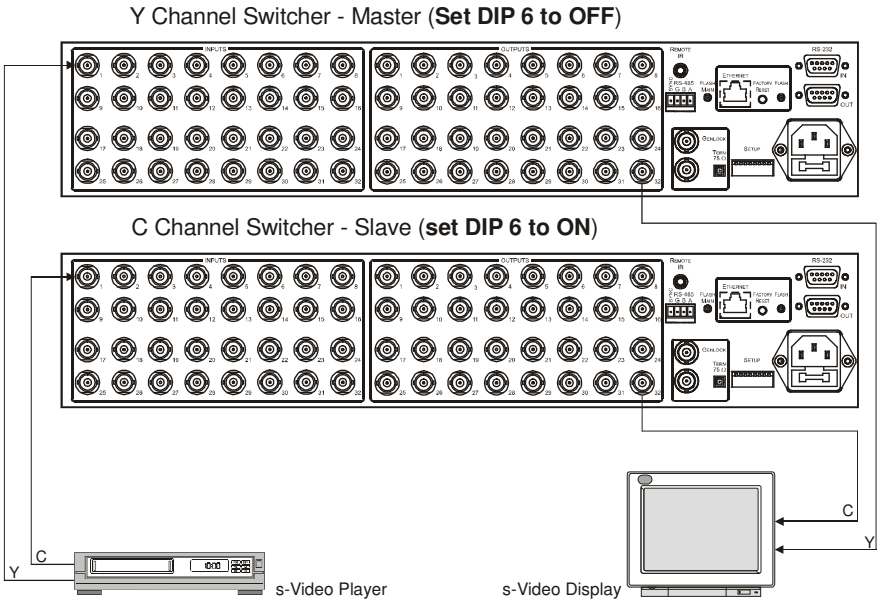



*Figure 4: Configuring a 32x32 s-Video (YC) Switcher with two VS-3232Vxl Switchers*

1 The INPUT 1 connectors on the Y switcher and the C switcher

2 The OUTPUT 32 connectors on the Y switcher and the C switcher

### 6.2.2 Configuring a 32x32 YUV/RGB Switcher (Three Units)

Configure a 32x32 video matrix switcher for YUV/RGB by combining[1] three **VS-3232Vxl** switchers. Note that the machine number on all three units must be identical.

Although in the example in Figure 5 only one input[2] and one output[3] are connected, you can connect all the inputs and outputs in the same way to create a 32x32 YUV/RGB switcher.

Connect the communication line via the RS-232 or RS-485 control interface as section 6.4 describes.

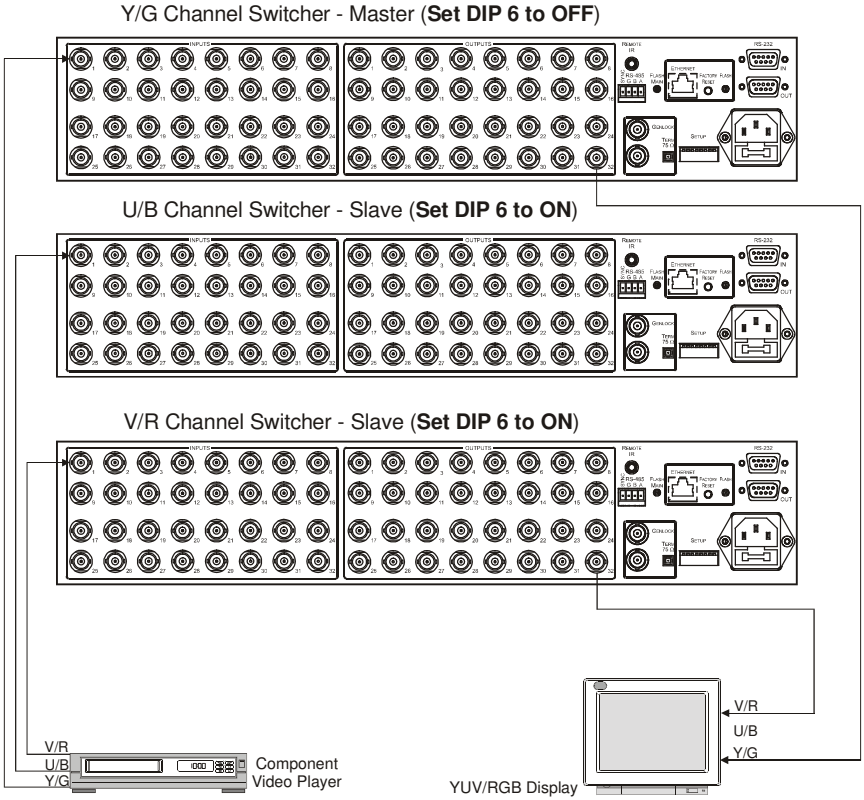



*Figure 5: Configuring a 32x32 YUV (RGB) Switcher with three VS-3232Vxl Switchers*

1 For a description of how to connect the RS-485 connectors between the VS-3232Vxl switchers, refer to section 6.4.2

2 The INPUT 1 connectors on the Y switcher, the U switcher and the V switcher

3 The OUTPUT 32 connectors on the Y switcher, the U switcher and the V switcher

### 6.2.3 Configuring a 32x32 RGBS Switcher (Four Units)

Configure four **VS-3232Vxl** switchers as a 32x32 video matrix switcher for RGBS[1], in a similar way to how Figure 5 in section 6.2.2 illustrates combining three **VS-3232Vxl** switchers for YUV (RGB).

## 6.3 Dipswitch Settings

Configure the **VS-3232Vxl** by setting the eight dipswitches as Figure 6 and Table 3 define:

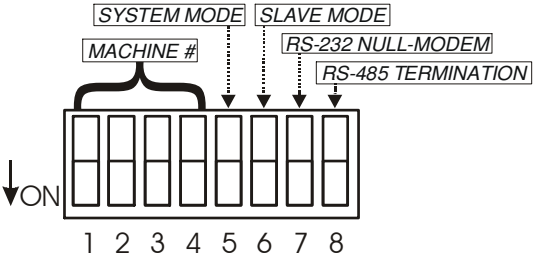



*Figure 6: Dipswitches*

*Table 3: Dipswitch Definitions*

| Dipswitch # | Function: |
|---|---|
| 1-4 | Set the MACHINE # (see Table 4 in section 6.3.1) |
| 5 | Enables (ON) or disables (OFF) the FOLLOW *SYSTEM* MODE in a multi-switcher configuration |
| 6 | Enables (ON) or disables (OFF) the *SLAVE* mode in a multi-channel configuration |
| 7 | Disables the use of a null modem adapter[2] with RS-232 as follows:<br>Set OFF for RS-232 input connection via a null modem adapter<br>Set ON for RS-232 input connection without a null modem adapter |
| 8 | Set ON for RS-485 termination for the first and the last machine (RS-485 line terminates with 110Ω); for others set OFF (RS-485 line is open) |

1 The S signal must be composite video SYNC (analog), not TTL

2 See section 6.4.1

### 6.3.1 Setting the MACHINE #

To control a unit remotely via RS-232, RS-485, IR or the Ethernet, each unit has to be identified via its unique Machine #. Set the Machine #[1] on a **VS-3232Vxl** unit according to Table 4.

*Table 4: Machine # Dipswitch Settings*

| Mach. # | DIP 1 | DIP 2 | DIP 3 | DIP 4 |
|---|---|---|---|---|
| 1 | ON | OFF | OFF | OFF |
| 2 | OFF | ON | OFF | OFF |
| 3 | ON | ON | OFF | OFF |
| 4 | OFF | OFF | ON | OFF |
| 5 | ON | OFF | ON | OFF |
| 6 | OFF | ON | ON | OFF |
| 7 | ON | ON | ON | OFF |
| 8 | OFF | OFF | OFF | ON |

| Mach. # | DIP 1 | DIP 2 | DIP 3 | DIP 4 |
|---|---|---|---|---|
| 9 | ON | OFF | OFF | ON |
| 10 | OFF | ON | OFF | ON |
| 11 | ON | ON | OFF | ON |
| 12 | OFF | OFF | ON | ON |
| 13 | ON | OFF | ON | ON |
| 14 | OFF | ON | ON | ON |
| 15 | ON | ON | ON | ON |

### 6.3.2 Understanding the System Mode

Though the terms *audio-follow-video*[2] and *audio breakaway*[3] are well known, there may be signals other than audio signals that need to be switched simultaneously and at other times, need to be switched independently.

For example:

- Non-linear editing systems that combine video with analog audio or with digital audio
- Duplication systems, that produce Master tapes from programs with different formats such as composite analog, component analog and component digital

The term *FOLLOW-SYSTEM*[4] indicates the most common case where any type of signal can follow one or more other signals.

DIP 5 defines whether the **VS-3232Vxl** unit can communicate with other switchers via a common control line.

You **can set DIP 5 OFF** to disable the *FOLLOW-SYSTEM* mode when setting a standalone switcher[5] application, including standalone multi-channel video switcher applications[6].

1 When using a single unit, set the unit to MACHINE # 1

2 Video and the audio channels switch simultaneously in the same way

3 Audio channels switch independently from the video channels

4 Instead of Audio-Follow-Video

5 See section 6.1

6 See section 6.2

You **must set DIP 5 ON** to enable the *FOLLOW-SYSTEM* mode in an interconnected varied-format switcher application.

You must set the machine number on each machine to a **different** value.

Refer to section 7.7 for a description of the *FOLLOW-SYSTEM* and *BREAKAWAY-FROM- SYSTEM* modes MENUs.

### 6.3.3 Understanding the Slave Mode

The SLAVE mode is only used for the multi-channel video switcher configuration, for example, when using three **VS-3232Vxl** units to form a YUV or an RGB switcher, as Figure 5 illustrates. One unit is used as the Master, and the other two units are Slaves. The Slaves always follow the Master. In the example illustrated in Figure 5, the first **VS-3232Vxl** unit is the Master (with DIP 6 set OFF enabling the Master mode) and the second and third **VS-3232Vxl** units are Slaves (with DIP 6 set ON enabling the Slave mode).

On all three machines the machine number must be set to the **same** value.

On both Slave **VS-3232Vxl** units, the LCD display[1], shows the following message:

The unit set in SLAVE mode
Front panel completely LOCKED

However, the display on each Slave **VS-3232Vxl** unit dynamically shows[2] all the changes that were made in the Master **VS-3232Vxl** unit.

The front panel control is managed via the Master **VS-3232Vxl** unit, on which the front panel buttons are unlocked and the LCD display illuminates.

1 At the time of powering the machines ON

2 Albeit with an LCD Display that does not illuminate

### 6.3.4 The System Mode *versus the* Master/Slave Mode

The Follow mode seems similar to the Slave mode since in both modes the unit switches via commands from another unit. Table 5 summarizes the differences between the System mode and the Slave mode:

*Table 5: The System Mode versus the Slave Mode*

| System Mode | Slave Mode |
|---|---|
| The unit can be switched in the Follow or Breakaway mode at any time, depending on the current application requirements. | The unit always follows the Master. It cannot be set in the breakaway (stand-alone) mode without turning off and rewiring. |
| Any unit can be turned on or off at any time. | The Slave unit can be turned ON only after full initialization of the Master unit. |

## 6.4 Connecting a Control Interface

You can connect a control interface (RS-232 or RS-485). The control interface must be identical on each switcher in the series of 32x32 matrix switchers; either RS-232 or RS-485. One control interface suffices. Do not use both RS-232 and RS-485 control interfaces in the same configuration. For example, in an interconnected varied-format 32x32 switcher application, if the switcher that connects to the PC connects via the RS-232 control interface, each switcher must interconnect via the RS-232 control interface and not via the RS-485 control interface.

You may transfer from one interface to another via the Kramer **VP-43xl** *Interface Converter*[1].

You can choose the RS-232 control interface, if the range is < 25 meters for each point-to-point connection.

For greater ranges, you can choose the RS-485 control interface, and operate the switcher from an extended distance of up to 1000 meters.

1 For more information on the VP-43xl, go to our Web site at http://www.kramerelectronics.com

### 6.4.1 Connecting the RS-232 Control Interface

You can connect several switchers (from the series of 32x32 or 16x16 matrix switchers) and the control unit in an RS-232 daisy chain arrangement, with or without using a Null-modem adapter, as Figure 7 illustrates.

The RS-232 daisy chain switcher arrangement is transparent. This lets you arrange the switchers (from the series of 32x32 or 16x16 matrix switchers) according to your requirements, and not according to a fixed sequence dependent on the Machine #.

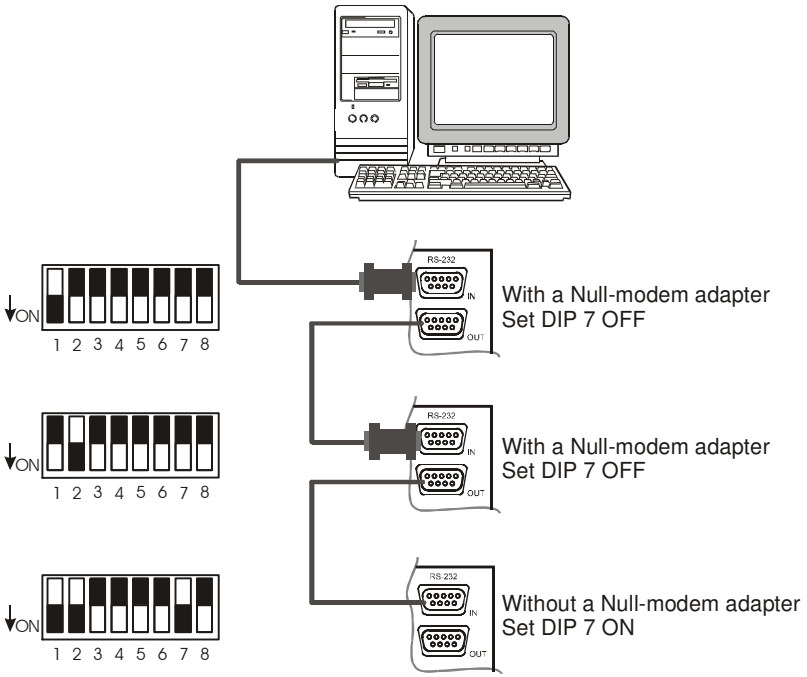



*Figure 7: Connecting a PC to Three VS-3232Vxl Units*

You can connect any of the following:

- The PC's DB9 COM port to a **VS-3232Vxl** unit[1] (see section 6.4.1.1)
- Two **VS-3232Vxl** units[1], (see section 6.4.1.2)

Important: powering OFF a unit inside the daisy-chain will destroy the daisy-chain connection.

1 With or without the Null-modem adapter

#### 6.4.1.1 Connecting a PC to a VS-3232Vxl Unit via RS-232

To connect a PC to a **VS-3232Vxl** unit, using the Null-modem adapter provided with the machine (the default):

1. Connect the RS-232 IN DB9F rear panel port on the Master **VS-3232Vxl** unit to the Null-modem adapter and connect the Null-modem adapter with a 9-wire flat cable[1] to the RS-232 DB9 port on your PC.
2. Set DIP 7 OFF[2] (enabling Null-modem adapter use) on the **VS-3232Vxl** unit.

To connect a PC to the **VS-3232Vxl** unit, without using a Null-modem adapter:

1. Connect the RS-232 DB9 port on your PC to the RS-232 IN DB9F rear panel port on the Master **VS-3232Vxl** with a 9-wire flat cable[1] to the RS-232 DB9 port on your PC.
2. Set DIP 7 ON[2] (disabling Null-modem adapter use) on the **VS-3232Vxl** unit.

#### 6.4.1.2 Connecting two VS-3232Vxl Units via RS-232

To connect two **VS-3232Vxl** units, using a Null-modem adapter provided with the machine (the default):

1. Connect a flat cable between the RS-232 OUT DB9M port on the first **VS-3232Vxl** unit and the Null-modem adapter that attaches to the RS-232 IN DB9F port on the second **VS-3232Vxl** unit.
2. On the second **VS-3232Vxl** unit, set DIP 7 OFF[2] (enabling Null-modem adapter use).

To connect two **VS-3232Vxl** units, without using a Null-modem adapter:

1. Connect a flat cable between the RS-232 OUT DB9M port on the first **VS-3232Vxl** unit and the RS-232 IN DB9F port on the second **VS-3232Vxl** unit.
2. On the second **VS-3232Vxl** unit, set DIP 7 ON (disabling Null-modem adapter use).

1 The flat cable should consist of at least three straight-through wires for PINs 2, 3 and 5

2 See section 6.2.3

### 6.4.2 Connecting the RS-485 Control Interface

Figure 8 defines the RS-485 connector PINOUT for external RS-485 control. The RS-485 connector is also used (if required) for vertical sync:

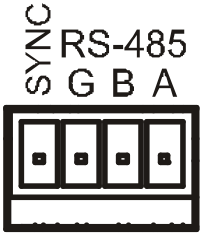



*Figure 8: RS-485 Connector PINOUT*

To connect an RS-485 connector on one **VS-3232Vxl** unit to an RS-485 connector on one or more other switchers (from the series of 32x32 or 16x16 matrix switchers), as Figure 9 illustrates:

1. Connect the "A" PIN on the first **VS-3232Vxl** unit to the "A" PIN on the second **VS-3232Vxl** unit and all the other units.
2. Connect the "B" PIN on the first **VS-3232Vxl** unit to the "B" PIN on the second **VS-3232Vxl** unit and all the other units.
3. If shielded cable is used for an RS-485 connection, you may connect the shield to the "G" (ground) PIN.

For details about how to configure the vertical sync (if required), refer to section 6.5 and section 8.1.

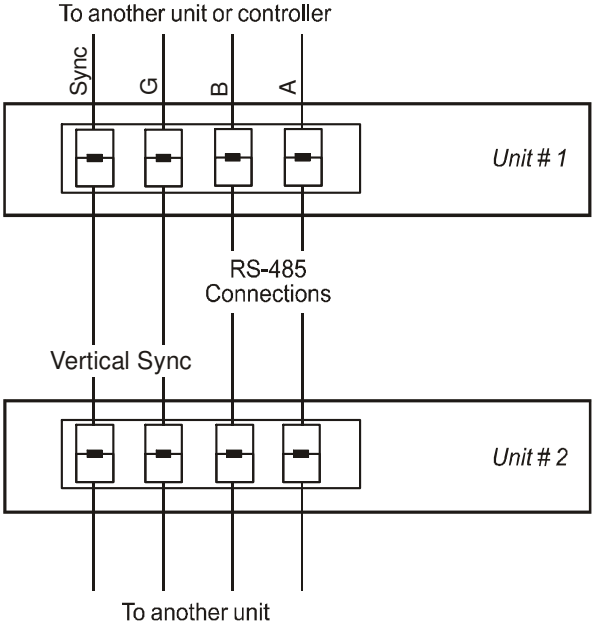



*Figure 9: Connecting the RS-485 Connectors between two VS-3232Vxl Units*

Figure 10 illustrates the RS-485 line that connects:

- Between each **VS-3232Vxl** unit
- To the PC via a Kramer Tools **VP-43xl** *Interface Converter* (connect the PC's DB 9 COM port to the RS-232 IN DB9F port on the **VP-43xl**. Next, connect the RS-485 port on the **VP-43xl** to the RS-485 ports on the **VS-3232Vxl** units)

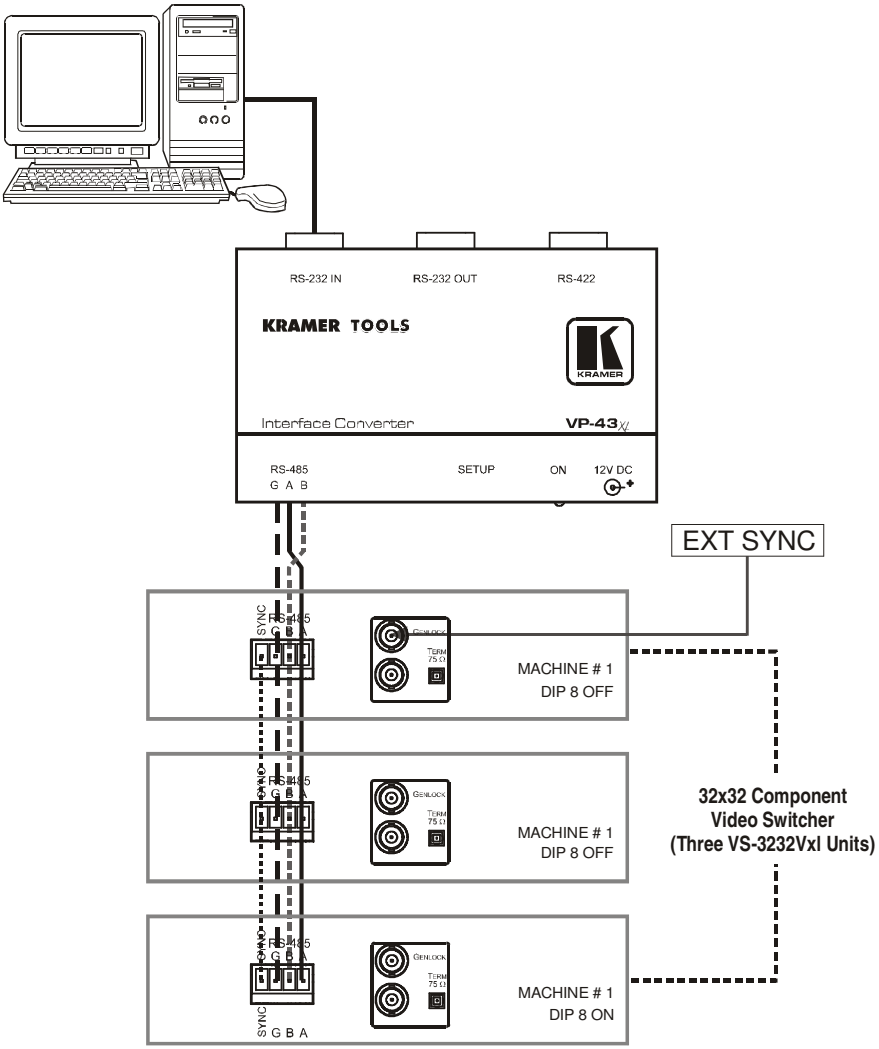



*Figure 10: RS-485 Control Interface and SYNC Connections for Component Switcher*

## 6.5 Configuring the Sync

You can configure the method of the switching between the video sources in the **VS-3232Vxl**. The switching (transition) is done according to the selection of the SYNC input:

- An EXTERNAL Sync (the GENLOCK BNC connector)
- The INPUT # 1 BNC connector, **or**
- An EXT-SYS SYNC[1] (a sync derived from another 32 or 16 series switcher) via the RS-485 sync Terminal Block connector[2]

You can also set the machine to the immediate switching mode, in which switching is executed immediately after receiving the command. This mode is not a glitch-free transition

Configure the sync via the SYNC Configuration Menu command setting[3]. When setting up for example, a 32x32 YUV switcher, linking a common sync to all the machines may be necessary to facilitate simultaneous vertical interval switching.

Usually, the easiest method is to choose the sync source from the first machine (for example, the Y unit in a 32x32 YUV switcher configuration, as section 6.2.2 describes) and then connect all the terminal block connectors[4], as Figure 10 illustrates.

In this case, set the first machine to select the sync source from the external sync connector or from the INPUT # 1 connector. This sync is now available to the other machines via the RS-485 terminal block connector, as Figure 8, Figure 9 and Figure 10 illustrate. Select the EXT-SYS SYNC[5] on the other machines that receive that sync.

1 External system sync

2 When using multiple machines in one system

3 Refer to section 8.1

4 Alternatively, you can use the GENLOCK BNC connectors on the rear panel

5 You can also select the immediate switching mode, in which the switching operation is executed immediately after receiving the command. This mode is not a glitch free transition

## 6.6 Controlling via the ETHERNET

You can connect the **VS-3232Vxl** via the Ethernet, using a crossover cable (see section 6.6.1) for direct connection to the PC or a straight through cable (see section 6.6.2) for connection via a network hub or network router[1].

### 6.6.1 Connecting the ETHERNET Port directly to a PC (Crossover Cable)

You can connect the Ethernet port of the **VS-3232Vxl** to the Ethernet port on your PC, via a crossover cable with RJ-45 connectors.

This type of connection is recommended for identification of the factory default IP Address of the **VS-3232Vxl** during the initial configuration

After connecting the Ethernet port, configure your PC as follows:

1. Right-click the My Network Places icon on your desktop.
2. Select **Properties**.
3. Right-click Local Area Connection Properties.
4. Select **Properties**.
   The Local Area Connection Properties window appears.
5. Select the Internet Protocol (TCP/IP) and click the **Properties** Button (see Figure 11).

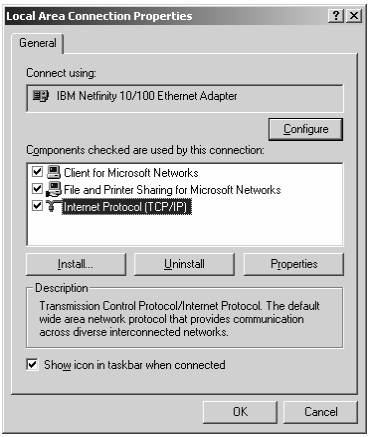



*Figure 11: Local Area Connection Properties Window*

1 After connecting the Ethernet port, you have to install and configure your Ethernet Port. For detailed instructions, see the "Ethernet Configuration (FC-11) guide.pdf" file in the technical support section on our Web site: http://www.kramerelectronics.com

6. Select Use the following IP Address, and fill in the details as shown in Figure 12.
7. Click **OK**.

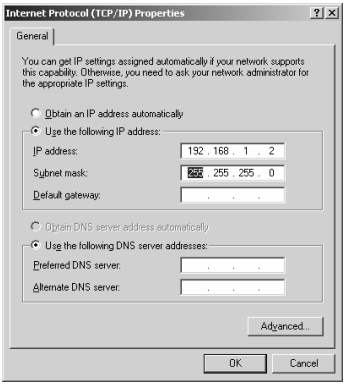

Internet Protocol (TCP/IP) Properties
General
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
192 . 168 . 1 . 2
Subnet mask:
255 . 255 . 255 . 0
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternate DNS server:
Advanced...
OK
Cancel

*Figure 12: Internet Protocol (TCP/IP) Properties Window*

### 6.6.2 Connecting the ETHERNET Port via a Network Hub (Straight-Through Cable)

You can connect the Ethernet port of the **VS-3232Vxl** to the Ethernet port on a network hub or network router, via a straight-through cable with RJ-45 connectors.

### 6.6.3 Control Configuration via the Ethernet Port

To control several units via the Ethernet, connect the Master unit (Machine # 1) via the Ethernet port to the LAN port of your PC. Use your PC initially to configure the settings (see section 6.6).

# 7 Operating Your Video Matrix Switcher

This section describes:

- The startup display (see section 7.1)
- How to use the selector buttons (see section 7.2)
- How to confirm actions (see section 7.3)
- The switching options (see section 7.4)
- How to store and recall setups (see section 7.5)
- The DEFAULT SETUP button (see section 7.6)
- How to Choose the FOLLOW or the BREAKAWAY modes (see section 7.7)
- How to Lock and unlock the front panel (see section 7.8)

## 7.1 Startup Display

After switching on the power, the LCD display[1] shows the following screens in sequence:

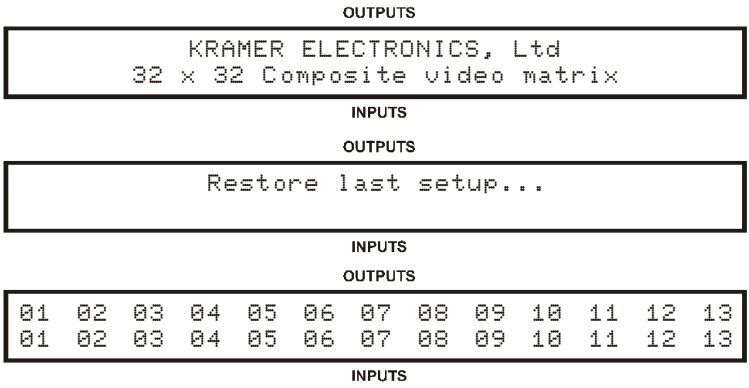

OUTPUTS
KRAMER ELECTRONICS, Ltd
32 x 32 Composite video matrix
INPUTS
OUTPUTS
Restore last setup...
INPUTS
OUTPUTS
01 02 03 04 05 06 07 08 09 10 11 12 13
01 02 03 04 05 06 07 08 09 10 11 12 13
INPUTS

*Figure 13: Default Startup Status Display Sequence*

The **VS-3232Vxl** does not have separate output and input pushbuttons. Instead, the front panel includes a numerical keyboard within the Selector Buttons area[2]. This keyboard that includes the numbers from 0 to 9, lets you enter both the output and input numbers.

1 The text in the LCD Display may vary (according to machine settings)

2 See Table 1

### 7.1.1 Viewing the Display

Figure 13 shows the output-input cross-points on the LCD display. The LCD display can show only 13 input/output combinations at a time from the available 32.

By shifting the contents of the display to the right or to the left, via the ► or the ◄ buttons on the front panel, respectively, you can view the full contents of the display.

This function is enabled when:

- The switcher is in between operations[1]
- Recalling a setup using the ► or ◄ buttons

When entering an OUT IN combination, the contents of the LCD display automatically shift to indicate the current status of the selected output.

## 7.2 Using the Selector Buttons

Since the **VS-3232Vxl** has 32 inputs and outputs (and up to 59 setups that can be recalled), it can handle two digit numbers as well as one digit numbers (for numbers under 10). When entering a one-digit number (for example 5), you can either press 0 followed by 5 or 5 followed by ENT.

The number 00 (or 0, ENT) is relevant for the input only and is used to disconnect the currently entered output number from the input.

The ESC button is used to cancel an operation without affecting the current status of the switcher. For example, if a wrong number is entered, press the ESC button to cancel the operation. The ESC button can also be used for cancelling a store/recall operation or to exit the setup menu at any stage.

## 7.3 Confirming Actions

You can choose to work in the At Once (the default[2]) or the Confirm mode.

In the At Once mode (the TAKE button is not illuminated):

- Pressing an OUT-IN combination implements the switch immediately
- You save time as execution is immediate and actions require no user confirmation
- No protection is offered to correct an erroneous action

1 Waiting for its next operation while all previous operations are complete or cancelled

2 For all actions except storing/recalling

In the Confirm mode (the TAKE button illuminates):

- You can key-in an action and then confirm it by pressing the TAKE button
- Every action requires user confirmation, protecting against erroneous switching
- Execution is delayed until the user confirms the action[1]

### 7.3.1 Toggling between the At Once and Confirm Modes

To toggle between the At Once and Confirm modes, do the following:

1. Press the TAKE button to toggle between the At Once mode (in which the TAKE button does not illuminate) and the Confirm mode (in which the TAKE button illuminates).
   Actions now require user confirmation and the TAKE button illuminates.
2. Press the illuminated TAKE button to toggle from the Confirm mode back to the At Once mode.
   Actions no longer require user confirmation and the TAKE button no longer illuminates.

You can toggle between the At Once and Confirm modes at any time, unless the TAKE button blinks.

### 7.3.2 Confirming a Switching Action

To confirm a switching action (in the Confirm mode), do the following:

1. Press an OUT-IN combination.
   The TAKE button blinks.
2. Press the blinking TAKE button to confirm the action.
   Once the action is executed, the TAKE button illuminates once again.

## 7.4 Switching Options

You can switch:

- One input to one output (see section 7.4.1)
- Several inputs to several outputs (see section 7.4.2)
- One input to all outputs (see section 7.4.3)

1 Failure to press the TAKE button within half minute (the Timeout) will abort the action

### 7.4.1 Switching one Input to one Output

To switch one input to one output (in the At Once mode):

1. Press the appropriate digit buttons (for example, 06 representing output 6).
   The LCD display shows the following on the right side:

   In_ _ => Out 06

   The left-hand side of the display shows a segment of the input-output display, automatically shifting the content to show the 06 output.
2. Press the appropriate input number (for example, 27 representing input 27):
   - When in the At Once mode, the switching takes place immediately and the LCD display shows a segment of the input-output status, including the switched input and output (for example 06-27)

     When in the Confirm mode, the LCD display shows the following:

     In 27 => Out 06
   - Press the blinking TAKE button to switch the input to the output

### 7.4.2 Switching several Inputs to several Outputs

In the At Once mode, the **VS-3232Vxl** will execute each OUT-IN combination separately (see section 7.4.1). If you want to switch several inputs to several outputs it is necessary to operate the machine in the Confirm mode.

In the Confirm mode you can key-in several actions and then confirm them by pressing the TAKE button once (simultaneously switching several inputs to several outputs).

To switch several inputs to several outputs in the Confirm mode (the TAKE LED is illuminated), do the following:

1. Press the appropriate digit buttons for an out-in combination.
   The TAKE button blinks.
   Key-in additional output-input combinations.
   The LCD display can show up to five keyed-in actions, as follows[1]:

   09 => 06  05 => 07
2. After completing the output-input switching sequence, press the blinking TAKE button to carry out the switching operation.
   The inputs switch to the respective outputs, as shown on the LCD display and the TAKE LED no longer blinks and remains illuminated.

1 In this example, input 9 is set to switch to output 06 and input 5 is set to switch to output 7

### 7.4.3 Switching one Input to all Outputs

To switch one input to all the outputs (in the At Once mode):

1. Press the MENU button once.
   The Menu buttons[1] illuminate and are enabled.
2. Press the illuminated ALL button.
   The LCD display shows the message:

   In___ => ALL
3. Press the appropriate digit buttons (for example, 09 representing input 9).
   All the outputs switch to this input. The LCD display shows all the outputs switched to the input 9.

To switch all the outputs to one input in the Confirm mode (the TAKE LED is illuminated), repeat the steps above and then press the blinking TAKE button to confirm the action.

### 7.4.4 Clearing an Output

To clear an output (in the At Once mode):

1. Press the MENU button once.
   The Menu buttons[1] illuminate and are enabled.
2. Press the illuminated OFF button.
   The LCD display shows the message:

   out___ => OFF
3. Press the appropriate digit buttons (for example, 25 representing output 25).
   This output is cleared (there is no input switched to this output).

To clear an output in the Confirm mode (the TAKE LED is illuminated), repeat the steps above and then press the blinking TAKE button to confirm the action.

Alternatively, you can perform a switching operation as described in section7.4.1 and set the input to 00.

### 7.4.5 Clearing several Outputs

To clear several outputs in the Confirm mode (the TAKE LED is illuminated), repeat the switching actions described in section 7.4.2 but set all the inputs to 00:

### 7.4.6 Clearing all Outputs

All the outputs can be cleared only through the configuration menu (see section 8.8).

1 The ALL, OFF, STO and RCl buttons

## 7.5 Storing and Recalling Setups

You can store up to 59 settings in the non-volatile memory with the ability to recall each of those settings.

### 7.5.1 Storing Setups

To store a setting, do the following:

1. Press the MENU button once.
   The Menu buttons[1] illuminate and are enabled.
2. Press the illuminated STO button.
   The LCD display shows the message:

   STORE => __

3. Insert a digit from 01 to 59 (for example, press 1 twice for 11).
   In the At Once mode, the action is immediately executed and the LCD display briefly shows[1]:

   Setup STORED

   Memory 11 now stores the current setting.

Note that when saving a setup to an already allocated memory, the TAKE button blinks and the LCD display shows the message:

Setup NOT Empty
CONFIRM

You can either:

- Press the TAKE button to overwrite the existing setup
- Press the ESC button to save the setup to a different memory location
- Press the ESC button twice to exit the storing operation

### 7.5.2 Recalling Setups

To recall a setting, do the following:

1. Press the MENU button once.
   The Menu buttons[1] illuminate and are enabled.
2. Press the illuminated RCL button.
   The LCD display shows the message:

   RECALL <= __

3. Insert the appropriate digits from 01 to 59[2] (for example, press 1 twice for 11).
   The LCD display shows the recalled setup.

1 In the confirm mode, the TAKE blinks and you have to press the TAKE button to confirm the operation

2 When trying to recall a setup beyond 59, the LCD display shows the following message: No more than 59

When in the CONFIRM mode (the TAKE button is illuminated), repeat the steps above and then press the TAKE button to confirm the action.

After recalling a setup in the CONFIRM mode, while the TAKE button is blinking, you can review the content of the recalled setup using the ► or the ◄ buttons.

If the recalled setup is not the desired one, you can recall another setup by entering a different setup number, thus letting you review as many setups as needed before implementing the required setup.

When trying to recall an empty setup[1], the LCD display shows the message:

```
Setup Empty
another  ## ?
```

followed by the message[2]:

```
RECALL <= __
```

## 7.6 Using the DEFAULT SETUP Button (Unity Setting)

You can select a configuration that is used often and store it as the default setup (or the UNITY setting), which can be recalled easily by pressing the DEFAULT SETUP button. You can enter the default setup via the menu commands (see section 8.5) and then recall it by the touch of a button.

The default setup stores a setup, which is defined via the DEFAULT SETUP configuration menu (see section 8.5). The default setup includes the switcher configuration and the cross-points status, or either one of them. The configuration menu lets you choose what information will be stored (and recalled accordingly) in the default setup.

If the machine is set to its default setup, the DEFAULT SETUP button illuminates. Otherwise it is off.

To set the machine to its default setup:

1. Press the DEFAULT SETUP button.
   The DEFAULT SETUP button LED blinks and the following message appears on the LCD display:

```
Recall DEFAULT setup
press FLASHING button to confirm
```

1 That is, a setup # for which no setup is actually stored

2 The same as in step 2 above

2. Press the DEFAULT SETUP button a second time to recall the default setup.
   The DEFAULT SETUP button stops blinking and no longer illuminates, the TAKE button blinks and the following message appears on the LCD display:

   all Setups and Connections change
   press TAKE to confirm

3. Press the TAKE button to confirm the action or press the ESC button to cancel the operation.
   If the DEFAULT SETUP was recalled, the DEFAULT SETUP button illuminates.

## 7.7 Choosing the FOLLOW or the BREAKAWAY Modes

When the **VS-3232Vxl** functions in the:

- FOLLOW-System mode, the **VS-3232Vxl** switches with other 32x32 or 16x16 matrix switchers, implementing the same action simultaneously
- BREAKAWAY-from-System mode, the **VS-3232Vxl** functions independently, implementing an action as a stand alone unit that is independent of the other units connected

The **VS-3232Vxl** unit will function in the FOLLOW-System mode if at least one other **VS-3232Vxl** unit is set to the FOLLOW-System mode and these units interconnect via an RS-232 and/or RS-485 communication line.

To set the **VS-3232Vxl** unit to function in the FOLLOW-System mode:

1. Press the FOLLOW button.
   The FOLLOW button blinks and the LCD display shows the following message:

   Set the FOLLOW SYSTEM mode
   press FLASHING button to confirm

2. Press the FOLLOW button once again.
   If there are no switchers online in the FOLLOW-System mode or if one or more switchers that are in the FOLLOW-System mode are online but their cross-points status is exactly the same as that of the **VS-3232Vxl**, the **VS-3232Vxl** immediately moves to the FOLLOW System mode.
   The FOLLOW stops blinking and then illuminates, the BREAKAWAY button no longer illuminates and the LCD display restores its last content.

If the cross-points status of the **VS-3232Vxl** is different from the other online switchers in the FOLLOW-System mode, the FOLLOW button stops blinking and the TAKE button blinks, and the LCD display shows the following message:

```
press TAKE to confirm
possible changing existing cross-points
```

3. Press the TAKE button.
   The **VS-3232Vxl** moves to the FOLLOW-System mode. The FOLLOW button illuminates, the BREAKAWAY button no longer illuminates, the cross-points change according to the status in the system, and the LCD display shows the new cross point settings.

To set the **VS-3232Vxl** unit to function in the BREAKAWAY-from-System mode:

1. Press the BREAKAWAY button.
   The BREAKAWAY button blinks and the LCD display shows the following message:

```
Set the STAND ALONE mode
press FLASHING button to confirm
```

2. Press the BREAKAWAY button once again.
   The switcher moves to the BREAKAWAY mode. The BREAKAWAY button illuminates, the FOLLOW button no longer illuminates and LCD display restores it last content

## 7.8 Using the LOCK Button

To prevent changing the settings accidentally or tampering with the unit via the front panel buttons, lock[1] your **VS-3232Vxl**. Unlocking releases the protection mechanism.

To toggle the status of the machine, press and hold the LOCK button.

1 Nevertheless, even though the front panel is locked you can still operate via RS-232 or RS-485 serial (remote controller or PC)

# 8 The MENU Commands

The menu lets you configure the **VS-3232Vxl** to best suit your needs.

To enter the configuration menu, press the menu button twice. The MENU button illuminates. And the following message appears on the LCD display:

```
Start configuration menu
MENU to view setups ENT to change them
```

When browsing through the configuration menu, the enabled buttons are illuminated.

The ESC button is not illuminated, but is always enabled.

Use the configuration menu as follows:

1. Press the MENU button to scroll through the menu items[1].
2. Press the ENT button to enter the options in a desired setup.
3. After entering a setup, you can select between several options.
   Select a setup option by pressing one of the illuminated buttons in the Selector Buttons area.
   After selecting the desired option, a description of the desired change appears on the LCD display and the TAKE button blinks.
4. Press the blinking TAKE button to execute the change.
   A description of the current state appears on the LCD display for about a second and then the unit automatically switches to the next item in the menu.

In the example, illustrated in Figure 14, the SYNC configuration is changed through the configuration menu. You can scroll through the menu items by pressing the menu button, until you reach the desired item.

1 The LCD display shows the current status of the selected menu item

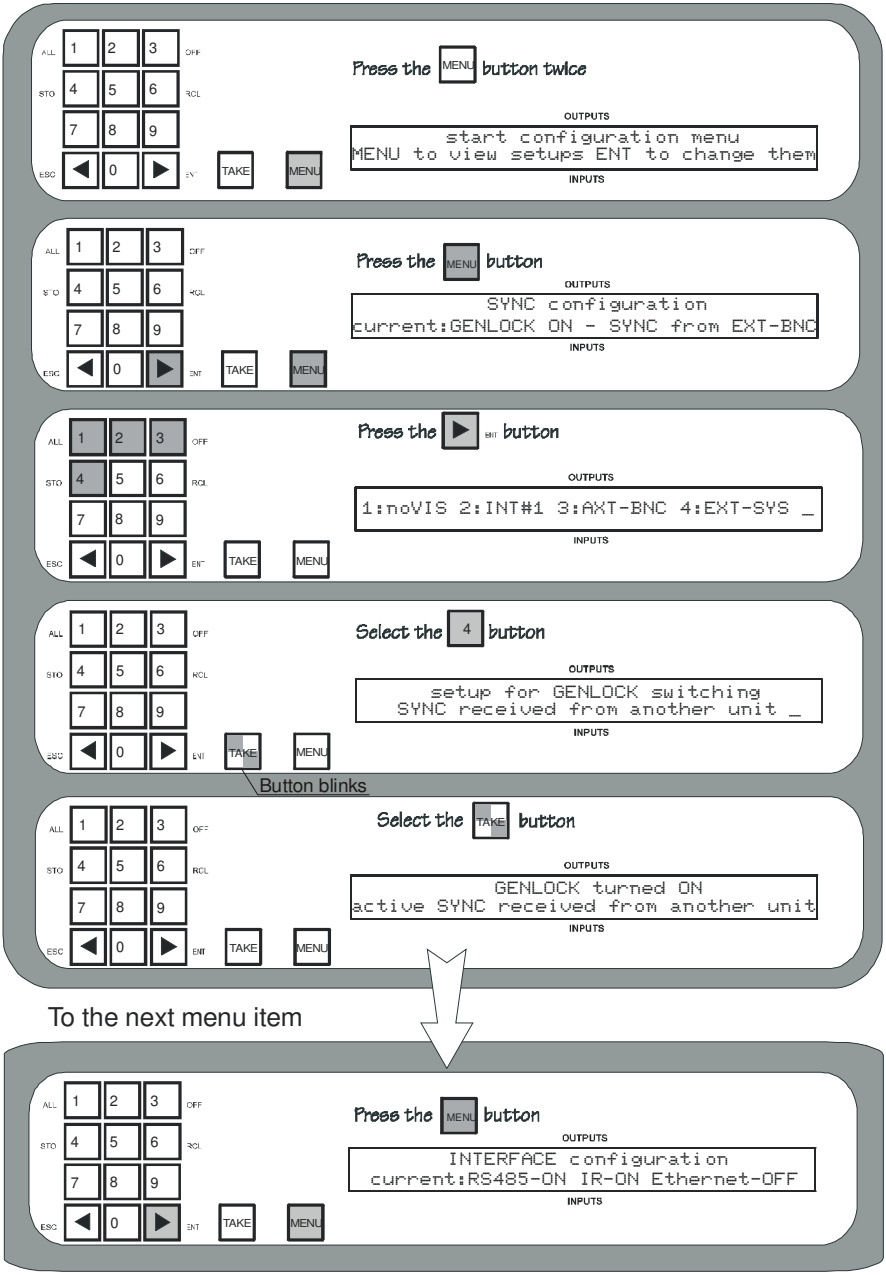



*Figure 14: Setting the SYNC Configuration (an example)*

The configuration menu includes the following items:

- SYNC configuration (see section 8.1)
- INTERFACE configuration (see section 8.2)
- Interface REPLY configuration (see section 8.3)
- PROTOCOL configuration (see section 8.4)
- DEFAULT setup configuration (see section 8.5)
- Store DEFAULT setup (see section 8.6)
- Indication of the current Firmware version (see section 8.7)
- TOTAL RESET options (see section 8.8)

## 8.1 Selecting the SYNC Configuration

Table 6 summarizes the SYNC configuration options:

*Table 6: SYNC Configuration Menu*

| Press: | To select: | After the change, the LCD displays: |
|---|---|---|
| 1 | **NoVIS**, for immediate switching | The unit is set for immediate switching |
| 2 | **INT#1**, SYNC extracted from input #1 | Active SYNC set from input #01 |
| 3 | **EXT-BNC**, SYNC extracted from GENLOCK input | Active SYNC set from GENLOCK input |
| 4 | **EXT-SYS**, SYNC received from another unit | Active SYNC set from another unit |

## 8.2 Selecting the INTERFACE Configuration

The INTERFACE configuration menu is a two step menu:

1. Select the type of interface.
2. Turn the interface ON or OFF.

Note that the RS-232 interface is always ON.

Table 7 summarizes the INTERFACE configuration options.

*Table 7: INTERFACE Configuration Menu*

| Press: | To select: | After the change, the LCD displays: |
|---|---|---|
| 1 | **RS485** | Interface RS-485 now active or, interface RS-485 now off |
| 2 | **IRremote** | IR remote now active or, IR remote now off |
| 3 | **Ethernet** | Network connection now active or network connection now off |

## 8.3 Selecting the Interface REPLY Configuration

Table 8 summarizes the interface REPLY configuration options:

*Table 8: Interface REPLY Configuration Menu*

| Press: | To select: | After the change: |
|---|---|---|
| 1 | **Turn reply ON** | All the interfaces that are set to ON accept and execute commands and also reply |
| 2 | **Never REPLY** | All the interfaces that are set to ON accept and execute commands but do not reply |

## 8.4 Selecting the PROTOCOL Configuration

Table 9 summarizes the PROTOCOL configuration options:

*Table 9: PROTOCOL Configuration Menu*

| Press: | To select: | After the change, the LCD displays: |
|---|---|---|
| 1 | **HEXadecimal**, for setting the protocol[1] to HEX KRAMER-2000 | Communication protocol set to HEX KRAMER-2000 |
| 2 | **ASCII**, for setting the protocol[1] to ASCII – SIERRA | Communication protocol set to ASCII – SIERRA |

## 8.5 Selecting the DEFAULT Setup Configuration

Table 10 summarizes the DEFAULT setup configuration options:

*Table 10: DEFAULT Setup Configuration Menu*

| Press: | To select: | After the change, the LCD Displays: |
|---|---|---|
| 1 | **Setup+crosspoints** | Store/recall DEFAULT MATRIX setup and cross-points |
| 2 | **crosspnts** | Store/recall DEFAULT ONLY cross-points |
| 3 | **setups** | Store/recall DEFAULT only MATRIX setup |

## 8.6 Selecting the store DEFAULT Setup Configuration

This option in the configuration menu lets you store the current setup to the default setup, so that by pressing the DEFAULT SETUP button on the front panel you can recall the default setup (so called UNITY setting).

After pressing the ENT button, the TAKE button blinks and the following message appears on the display:

```
current matrix stage is OKAY?
press TAKE to confirm
```

After pressing the blinking TAKE button, the display shows:

```
current matrix stage
stored as DEFAULT setup
```

1 See section 11 for a description of the protocols

## 8.7 The Main Firmware Version

The main firmware version menu shows information regarding the latest main and Ethernet firmware versions, for example:

```
Main Firmware Version: 1.00
Ethernet Version: Use Config. Manager
```

This information lets you decide whether a firmware upgrade is required.

> It is recommended to upgrade the firmware only after consulting with the Kramer technical support staff

## 8.8 Selecting the TOTAL RESET Option

The TOTAL RESET options requires you to press the blinking TAKE button twice for double confirmation. Table 11 summarizes the TOTAL RESET menu options:

*Table 11: Total Reset Menu*

| Press: | To select: | After the change, the LCD displays: |
|---|---|---|
| 1 | **All outputs OFF**, to disconnect all the outputs | MATRIX erased |
| 2 | **Factory default**, to the factory default state | The Machine resets as follows:<br>• OUT 1 is connected to IN 1, OUT 2 is connected to IN 2 … OUT 31 is connected to IN 31 and OUT 32 is connected to IN 32<br>• The SYNC is extracted from the BNC-Genlock Input<br>• All the interfaces are set to ON<br>• The interface Reply is set to Reply<br>• The interface protocol is set to Hex Kramer-2000<br>• The DEFAULT SETUP is set to Matrix setup and cross-points |

# 9 Flash Memory Upgrade

The **VS-3232Vxl** lets you upgrade both the:

- Switcher Microcontroller (see section 9.1)
- Ethernet Microcontroller (see section 9.2)

## 9.1 Switcher Flash Memory Upgrade

The **VS-3232Vxl** firmware is located in FLASH memory, which can be upgraded to the latest Kramer firmware version in minutes! The process involves:

- Downloading from the Internet (see section 9.1.1)
- Connecting the PC to the RS-232 port (see section 9.1.2)
- Upgrading Firmware (see section 9.1.3)

### 9.1.1 Downloading from the Internet

You can download the up-to-date file[1] from the Internet. To do so:

1. Go to our Web site at www.kramerelectronics.com and download the file: "*FLIP_VS3232Vxl.zip*" from the Technical Support section.
2. Extract the file: "*FLIP_VS3232Vxl.zip*" to a folder (for example, C:\Program Files\Kramer Flash).
3. Create a shortcut on your desktop to the file: "*FLIP.EXE*".

### 9.1.2 Connecting the PC to the RS-232 Port

Before installing the latest Kramer firmware version on a **VS-3232Vxl** unit, do the following:

1. Turn the unit OFF.
2. Connect the RS-232 DB9 rear panel port according to section 6.4.1.
3. Push the rear panel FLASH MAIN button through the hole using a small screwdriver.
4. Switch the unit ON.

Note: this sequence is critical – first push the FLASH MAIN button and then turn on the unit

1 The files indicated in this section are given as an example only. File names are liable to change from time to time

### 9.1.3 Upgrading Firmware

Follow these steps to upgrade the firmware:

1. Double click the desktop icon: "*Shortcut to FLIP.EXE*".
   The Splash screen appears as follows:

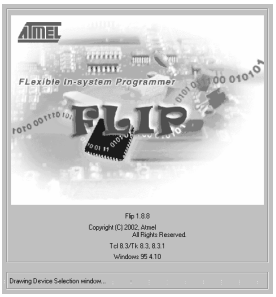



*Figure 15: Splash Screen*

2. After a few seconds, the Splash screen is replaced by the "*Atmel – Flip*" window:

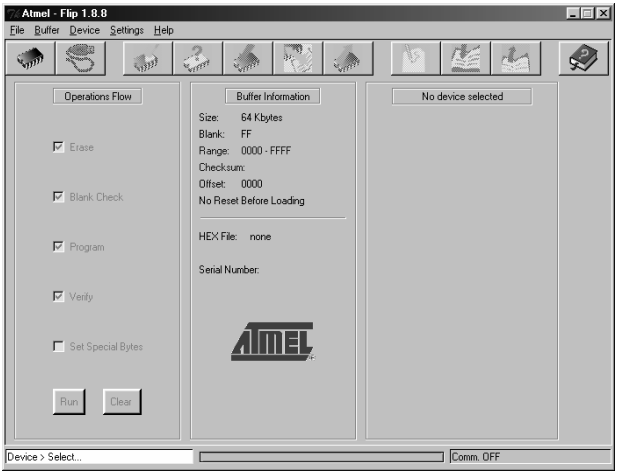



*Figure 16: Atmel – Flip Window*

3. Press the keyboard shortcut key *F2* (or select the "*Select*" command from the *Device* menu, or press the integrated circuit icon in the upper right corner of the window).
   The "*Device Selection*" window appears:

*Figure 17: Device Selection Window*

4. Click the button next to the name of the device and select from the list: AT89C51ED2:

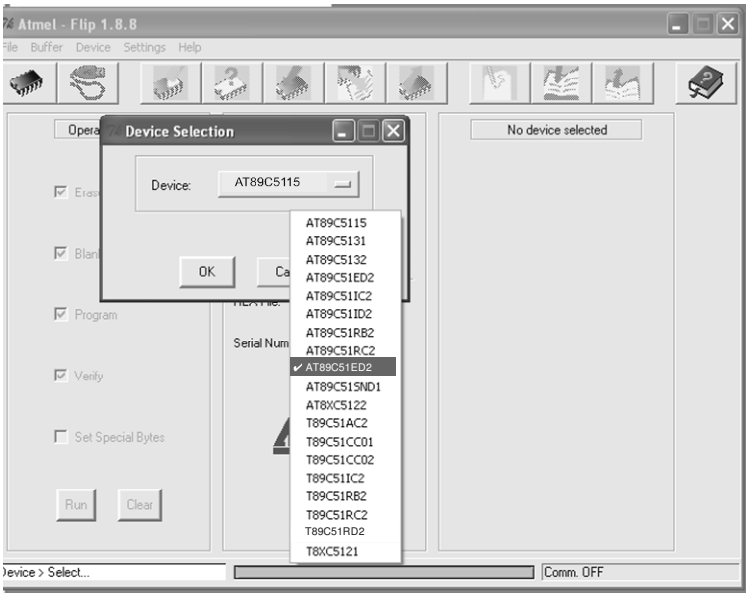



*Figure 18: Device Selection window*

5. Click OK and select "*Load Hex*" from the *File* menu.

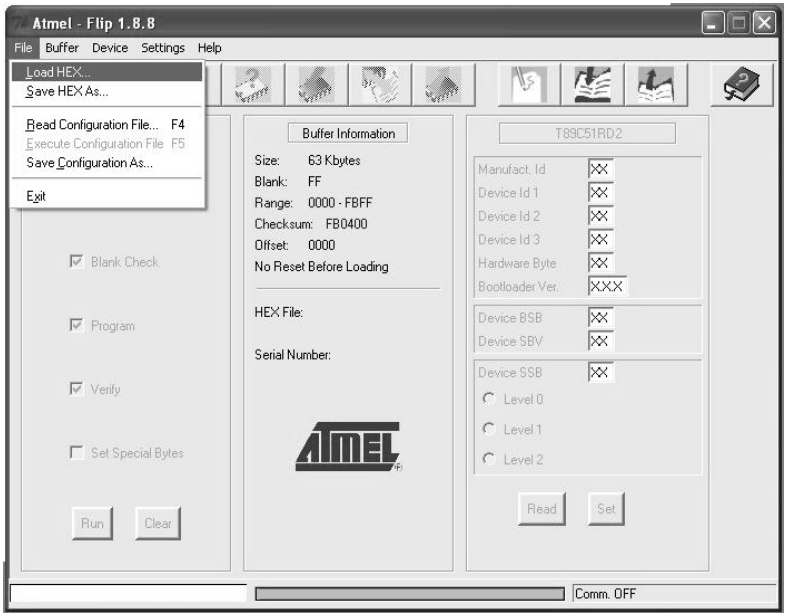



*Figure 19: Loading the Hex*

6. The Open File window opens. Select the correct HEX file that contains the updated version of the firmware for **VS-3232Vxl** (for example ***32M_V1p2.hex***) and click Open.
7. Press the keyboard shortcut key *F3* (or select the "*Communication / RS232*" command from the *Settings* menu, or press the keys: *Alt SCR*).
   The "*RS232*" window appears. Change the COM port according to the configuration of your computer and select the 9600 baud rate:

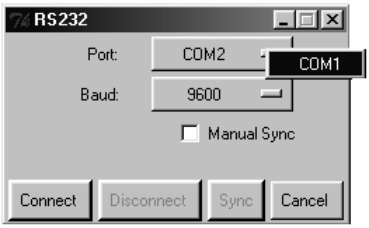



*Figure 20: RS-232 Window*

8. Click Connect.
   In the "*Atmel – Flip*" window, in the *Operations Flow* column, the *Run* button is active, and the name of the chip appears as the name of the third column: *AT89C51RD2*.

Verify that in the *Buffer Information* column, the "*HEX File: VS3232Vxl.hex*" appears.

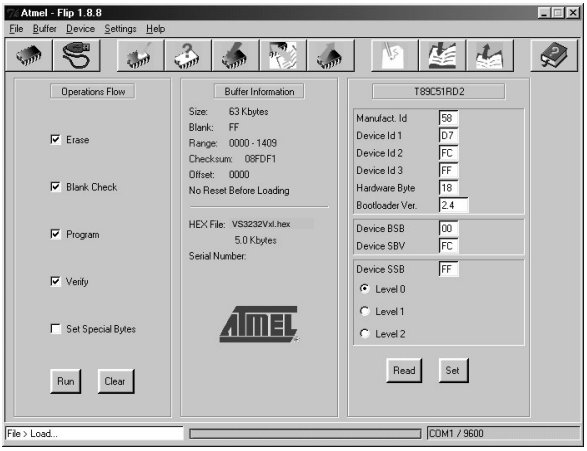



*Figure 21: Atmel – Flip Window (Connected)*

9. Click *Run*.
   After each stage of the operation is completed, the check-box for that stage becomes colored green[1].
   When the operation is completed, all 4 check-boxes will be colored green and the status bar message: *Memory Verify Pass* appears[2]:

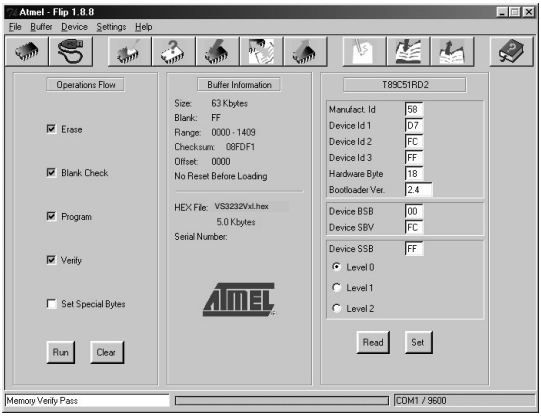



*Figure 22: Atmel – Flip Window (Operation Completed)*

1 See also the blue progress indicator on the status bar

2 If an error message: "Not Finished" shows, click Run again

10. Close the "*Atmel – Flip*" window.
11. Disconnect the power on the **VS-3232Vxl**.
12. If required, disconnect the *RS-232* rear panel port on the **VS-3232Vxl** unit from the Null-modem adapter.
13. Release the FLASH MAIN button on the rear panel.
14. Connect the power to the **VS-3232Vxl**.
    Upon initialization, the new **VS-3232Vxl** software version shows in the INPUT STATUS 7-segment Display.

## 9.2 Ethernet Flash Memory Upgrade

The **VS-3232Vxl** firmware is located in FLASH memory, which lets you upgrade to the latest Kramer firmware version in minutes!

The process involves:

- Downloading the upgrade package from the Internet
- Connecting the PC to the RS-232 port
- Upgrading the firmware

### 9.2.1 Downloading from the Internet

You can download the up-to-date file[1] from the Internet. To do so:

1. Go to our Web site at http://www.Kramerelectronics.com and download the file: "*SetKFRETH11-xx.zip*" from the technical support section.
2. Extract the file "*SetKFRETH11-xx.zip*" package, which includes the KFR-Programmer application setup and the *.s19* firmware file, to a folder (for example, C:\Program Files\KFR Upgrade).
3. Install the KFR-Programmer Application.

### 9.2.2 Connecting the PC to the RS-232 Port

Before installing the latest Kramer Ethernet firmware version on the **VS-3232Vxl**, do the following:

1. Connect the RS-232 IN DB9 port (COM 1) on the **VS-3232Vxl** to a Null-modem adapter and connect the Null-modem adapter with a 9-wire flat cable to the RS-232 DB9 COM port on your PC.
2. Push the rear panel ETHERNET FLASH button to **Program** using a small screwdriver.
3. Connect the power on your machine.

1 File names are liable to change from time to time

### 9.2.3 Upgrading Firmware

Follow these steps to upgrade the firmware:

1. Double click the KFR-Programmer desktop icon.
   The KFR-Programmer window appears (see Figure 23).

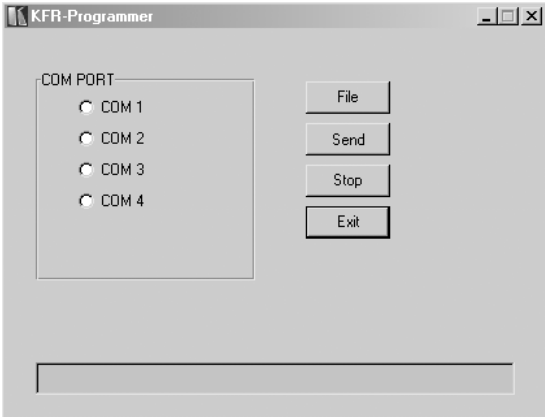



*Figure 23: The KFR-Programmer Window*

2. Select the required COM Port[1].
3. Press the File button to select the *.s19* firmware file included in the package.
4. Press the Send button to download the file. The Send button lights red.
5. Wait until downloading is completed and the red Send button turns off.
6. Disconnect the power on the **VS-3232Vxl**.
7. Release the ETHERNET FLASH button on the rear panel.
8. Connect the power on your machine.

1 To which the VS-3232Vxl is connected on your PC

# 10 Technical Specifications

Table 12 includes the technical specifications:

*Table 12: Technical Specifications[1] of the VS-3232Vxl Video Matrix Switcher*

| | |
|---|---|
| INPUTS: | 32 composite video, 1Vpp / 75Ω on BNC connectors |
| OUTPUTS: | 32 composite video, 1Vpp / 75Ω on BNC connectors |
| VIDEO BANDWIDTH: | 500MHz, -3dB / >50MHz, 0.1dB |
| ALL HOSTILE CROSSTALK: | <-49dB @5MHz |
| NON LINEARITY | <0.1% |
| VIDEO S/N: | 63dB unweighted / 70dB @5MHz weighted |
| DIFF. GAIN: | <0.05% / 0.8Vpp |
| DIFF. PHASE: | <0.03 Deg. |
| K-FACTOR: | <0.05% |
| CONTROL: | 19 pushbutton switches; RS-232, RS-485, IR remote, Ethernet |
| COUPLING: | DC |
| SWITCHING: | 3 modes for Vertical interval switching and Immediate switching |
| DIMENSIONS: | 19-inch (W), 7-inch (D) 2U (H) rack-mountable |
| POWER SOURCE: | 230 VAC, 50/60Hz, (115VAC, U.S.A.) 10VA |
| WEIGHT: | 3.5kg (7.8 lbs.) approx |
| ACCESSORIES: | Power cord, Null modem adapter, Windows®-based Kramer control software, Windows®-based Ethernet Configuration Manager and Virtual Serial Port Manager, Infra-red remote control transmitter |

1 Specifications are subject to change without notice

# 11 Communication Protocols

Using the menu, you can select between the:

- Kramer 2000 communication protocol (see section 11.1), or
- ASCII Protocol (see section 11.2)

## 11.1 The Kramer 2000 Communication Protocol

Table 13 and Table 14 include the Protocol 2000[1] hexadecimal codes[2]. The communication parameters are: 9600 baud, with no parity, 8 data bits and 1 stop bit.

1 Full details are available on our Web site: www.kramerelectronics.com

2 This example assumes MACHINE # 1, and node 0

*Table 13: Hex Table (IN 1-32 to OUT 1-16)*

| | OUT 1 | OUT 2 | OUT 3 | OUT 4 | OUT 5 | OUT 6 | OUT 7 | OUT 8 | OUT 9 | OUT 10 | OUT 11 | OUT 12 | OUT 13 | OUT 14 | OUT 15 | OUT 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IN 1** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 2** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 | 82 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 3** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 | 83 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 4** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 | 84 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 5** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 | 85 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 6** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 | 86 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 7** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 | 87 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 8** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 | 88 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 9** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 | 89 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 10** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 8A | 8A | 8A | 8A | 8A | 8A | 8A | 8A | 8A | 8A | 8A | 8A | 8A | 8A | 8A | 8A |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 11** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 8B | 8B | 8B | 8B | 8B | 8B | 8B | 8B | 8B | 8B | 8B | 8B | 8B | 8B | 8B | 8B |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 12** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 8C | 8C | 8C | 8C | 8C | 8C | 8C | 8C | 8C | 8C | 8C | 8C | 8C | 8C | 8C | 8C |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 13** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 8D | 8D | 8D | 8D | 8D | 8D | 8D | 8D | 8D | 8D | 8D | 8D | 8D | 8D | 8D | 8D |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 14** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 8E | 8E | 8E | 8E | 8E | 8E | 8E | 8E | 8E | 8E | 8E | 8E | 8E | 8E | 8E | 8E |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 15** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 8F | 8F | 8F | 8F | 8F | 8F | 8F | 8F | 8F | 8F | 8F | 8F | 8F | 8F | 8F | 8F |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 16** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 17** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 | 91 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |

| | OUT 1 | OUT 2 | OUT 3 | OUT 4 | OUT 5 | OUT 6 | OUT 7 | OUT 8 | OUT 9 | OUT 10 | OUT 11 | OUT 12 | OUT 13 | OUT 14 | OUT 15 | OUT 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IN 18** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 19** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 20** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 21** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 22** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 23** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 24** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 25** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 26** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 27** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 28** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 29** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 30** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 31** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 32** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 |
| | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 8A | 8B | 8C | 8D | 8E | 8F | 90 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |

*Table 14: Hex Table (IN 1-32 to OUT 17-32)*

| | OUT 17 | OUT 18 | OUT 19 | OUT 20 | OUT 21 | OUT 22 | OUT 23 | OUT 24 | OUT 25 | OUT 26 | OUT 27 | OUT 28 | OUT 29 | OUT 30 | OUT 31 | OUT 32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IN 1** | 01<br>81<br>91<br>81 | 01<br>81<br>92<br>81 | 01<br>81<br>93<br>81 | 01<br>81<br>94<br>81 | 01<br>81<br>95<br>81 | 01<br>81<br>96<br>81 | 01<br>81<br>97<br>81 | 01<br>81<br>98<br>81 | 01<br>81<br>99<br>81 | 01<br>81<br>9A<br>81 | 01<br>81<br>9B<br>81 | 01<br>81<br>9C<br>81 | 01<br>81<br>9D<br>81 | 01<br>81<br>9E<br>81 | 01<br>81<br>9F<br>81 | 01<br>81<br>A0<br>81 |
| **IN 2** | 01<br>82<br>91<br>81 | 01<br>82<br>92<br>81 | 01<br>82<br>93<br>81 | 01<br>82<br>94<br>81 | 01<br>82<br>95<br>81 | 01<br>82<br>96<br>81 | 01<br>82<br>97<br>81 | 01<br>82<br>98<br>81 | 01<br>82<br>99<br>81 | 01<br>82<br>9A<br>81 | 01<br>82<br>9B<br>81 | 01<br>82<br>9C<br>81 | 01<br>82<br>9D<br>81 | 01<br>82<br>9E<br>81 | 01<br>82<br>9F<br>81 | 01<br>82<br>A0<br>81 |
| **IN 3** | 01<br>83<br>91<br>81 | 01<br>83<br>92<br>81 | 01<br>83<br>93<br>81 | 01<br>83<br>94<br>81 | 01<br>83<br>95<br>81 | 01<br>83<br>96<br>81 | 01<br>83<br>97<br>81 | 01<br>83<br>98<br>81 | 01<br>83<br>99<br>81 | 01<br>83<br>9A<br>81 | 01<br>83<br>9B<br>81 | 01<br>83<br>9C<br>81 | 01<br>83<br>9D<br>81 | 01<br>83<br>9E<br>81 | 01<br>83<br>9F<br>81 | 01<br>83<br>A0<br>81 |
| **IN 4** | 01<br>84<br>91<br>81 | 01<br>84<br>92<br>81 | 01<br>84<br>93<br>81 | 01<br>84<br>94<br>81 | 01<br>84<br>95<br>81 | 01<br>84<br>96<br>81 | 01<br>84<br>97<br>81 | 01<br>84<br>98<br>81 | 01<br>84<br>99<br>81 | 01<br>84<br>9A<br>81 | 01<br>84<br>9B<br>81 | 01<br>84<br>9C<br>81 | 01<br>84<br>9D<br>81 | 01<br>84<br>9E<br>81 | 01<br>84<br>9F<br>81 | 01<br>84<br>A0<br>81 |
| **IN 5** | 01<br>85<br>91<br>81 | 01<br>85<br>92<br>81 | 01<br>85<br>93<br>81 | 01<br>85<br>94<br>81 | 01<br>85<br>95<br>81 | 01<br>85<br>96<br>81 | 01<br>85<br>97<br>81 | 01<br>85<br>98<br>81 | 01<br>85<br>99<br>81 | 01<br>85<br>9A<br>81 | 01<br>85<br>9B<br>81 | 01<br>85<br>9C<br>81 | 01<br>85<br>9D<br>81 | 01<br>85<br>9E<br>81 | 01<br>85<br>9F<br>81 | 01<br>85<br>A0<br>81 |
| **IN 6** | 01<br>86<br>91<br>81 | 01<br>86<br>92<br>81 | 01<br>86<br>93<br>81 | 01<br>86<br>94<br>81 | 01<br>86<br>95<br>81 | 01<br>86<br>96<br>81 | 01<br>86<br>97<br>81 | 01<br>86<br>98<br>81 | 01<br>86<br>99<br>81 | 01<br>86<br>9A<br>81 | 01<br>86<br>9B<br>81 | 01<br>86<br>9C<br>81 | 01<br>86<br>9D<br>81 | 01<br>86<br>9E<br>81 | 01<br>86<br>9F<br>81 | 01<br>86<br>A0<br>81 |
| **IN 7** | 01<br>87<br>91<br>81 | 01<br>87<br>92<br>81 | 01<br>87<br>93<br>81 | 01<br>87<br>94<br>81 | 01<br>87<br>95<br>81 | 01<br>87<br>96<br>81 | 01<br>87<br>97<br>81 | 01<br>87<br>98<br>81 | 01<br>87<br>99<br>81 | 01<br>87<br>9A<br>81 | 01<br>87<br>9B<br>81 | 01<br>87<br>9C<br>81 | 01<br>87<br>9D<br>81 | 01<br>87<br>9E<br>81 | 01<br>87<br>9F<br>81 | 01<br>87<br>A0<br>81 |
| **IN 8** | 01<br>88<br>91<br>81 | 01<br>88<br>92<br>81 | 01<br>88<br>93<br>81 | 01<br>88<br>94<br>81 | 01<br>88<br>95<br>81 | 01<br>88<br>96<br>81 | 01<br>88<br>97<br>81 | 01<br>88<br>98<br>81 | 01<br>88<br>99<br>81 | 01<br>88<br>9A<br>81 | 01<br>88<br>9B<br>81 | 01<br>88<br>9C<br>81 | 01<br>88<br>9D<br>81 | 01<br>88<br>9E<br>81 | 01<br>88<br>9F<br>81 | 01<br>88<br>A0<br>81 |
| **IN 9** | 01<br>89<br>91<br>81 | 01<br>89<br>92<br>81 | 01<br>89<br>93<br>81 | 01<br>89<br>94<br>81 | 01<br>89<br>95<br>81 | 01<br>89<br>96<br>81 | 01<br>89<br>97<br>81 | 01<br>89<br>98<br>81 | 01<br>89<br>99<br>81 | 01<br>89<br>9A<br>81 | 01<br>89<br>9B<br>81 | 01<br>89<br>9C<br>81 | 01<br>89<br>9D<br>81 | 01<br>89<br>9E<br>81 | 01<br>89<br>9F<br>81 | 01<br>89<br>A0<br>81 |
| **IN 10** | 01<br>8A<br>91<br>81 | 01<br>8A<br>92<br>81 | 01<br>8A<br>93<br>81 | 01<br>8A<br>94<br>81 | 01<br>8A<br>95<br>81 | 01<br>8A<br>96<br>81 | 01<br>8A<br>97<br>81 | 01<br>8A<br>98<br>81 | 01<br>8A<br>99<br>81 | 01<br>8A<br>9A<br>81 | 01<br>8A<br>9B<br>81 | 01<br>8A<br>9C<br>81 | 01<br>8A<br>9D<br>81 | 01<br>8A<br>9E<br>81 | 01<br>8A<br>9F<br>81 | 01<br>8A<br>A0<br>81 |
| **IN 11** | 01<br>8B<br>91<br>81 | 01<br>8B<br>92<br>81 | 01<br>8B<br>93<br>81 | 01<br>8B<br>94<br>81 | 01<br>8B<br>95<br>81 | 01<br>8B<br>96<br>81 | 01<br>8B<br>97<br>81 | 01<br>8B<br>98<br>81 | 01<br>8B<br>99<br>81 | 01<br>8B<br>9A<br>81 | 01<br>8B<br>9B<br>81 | 01<br>8B<br>9C<br>81 | 01<br>8B<br>9D<br>81 | 01<br>8B<br>9E<br>81 | 01<br>8B<br>9F<br>81 | 01<br>8B<br>A0<br>81 |
| **IN 12** | 01<br>8C<br>91<br>81 | 01<br>8C<br>92<br>81 | 01<br>8C<br>93<br>81 | 01<br>8C<br>94<br>81 | 01<br>8C<br>95<br>81 | 01<br>8C<br>96<br>81 | 01<br>8C<br>97<br>81 | 01<br>8C<br>98<br>81 | 01<br>8C<br>99<br>81 | 01<br>8C<br>9A<br>81 | 01<br>8C<br>9B<br>81 | 01<br>8C<br>9C<br>81 | 01<br>8C<br>9D<br>81 | 01<br>8C<br>9E<br>81 | 01<br>8C<br>9F<br>81 | 01<br>8C<br>A0<br>81 |
| **IN 13** | 01<br>8D<br>91<br>81 | 01<br>8D<br>92<br>81 | 01<br>8D<br>93<br>81 | 01<br>8D<br>94<br>81 | 01<br>8D<br>95<br>81 | 01<br>8D<br>96<br>81 | 01<br>8D<br>97<br>81 | 01<br>8D<br>98<br>81 | 01<br>8D<br>99<br>81 | 01<br>8D<br>9A<br>81 | 01<br>8D<br>9B<br>81 | 01<br>8D<br>9C<br>81 | 01<br>8D<br>9D<br>81 | 01<br>8D<br>9E<br>81 | 01<br>8D<br>9F<br>81 | 01<br>8D<br>A0<br>81 |
| **IN 14** | 01<br>8E<br>91<br>81 | 01<br>8E<br>92<br>81 | 01<br>8E<br>93<br>81 | 01<br>8E<br>94<br>81 | 01<br>8E<br>95<br>81 | 01<br>8E<br>96<br>81 | 01<br>8E<br>97<br>81 | 01<br>8E<br>98<br>81 | 01<br>8E<br>99<br>81 | 01<br>8E<br>9A<br>81 | 01<br>8E<br>9B<br>81 | 01<br>8E<br>9C<br>81 | 01<br>8E<br>9D<br>81 | 01<br>8E<br>9E<br>81 | 01<br>8E<br>9F<br>81 | 01<br>8E<br>A0<br>81 |
| **IN 15** | 01<br>8F<br>91<br>81 | 01<br>8F<br>92<br>81 | 01<br>8F<br>93<br>81 | 01<br>8F<br>94<br>81 | 01<br>8F<br>95<br>81 | 01<br>8F<br>96<br>81 | 01<br>8F<br>97<br>81 | 01<br>8F<br>98<br>81 | 01<br>8F<br>99<br>81 | 01<br>8F<br>9A<br>81 | 01<br>8F<br>9B<br>81 | 01<br>8F<br>9C<br>81 | 01<br>8F<br>9D<br>81 | 01<br>8F<br>9E<br>81 | 01<br>8F<br>9F<br>81 | 01<br>8F<br>A0<br>81 |
| **IN 16** | 01<br>90<br>91<br>81 | 01<br>90<br>92<br>81 | 01<br>90<br>93<br>81 | 01<br>90<br>94<br>81 | 01<br>90<br>95<br>81 | 01<br>90<br>96<br>81 | 01<br>90<br>97<br>81 | 01<br>90<br>98<br>81 | 01<br>90<br>99<br>81 | 01<br>90<br>9A<br>81 | 01<br>90<br>9B<br>81 | 01<br>90<br>9C<br>81 | 01<br>90<br>9D<br>81 | 01<br>90<br>9E<br>81 | 01<br>90<br>9F<br>81 | 01<br>90<br>A0<br>81 |
| **IN 17** | 01<br>91<br>91<br>81 | 01<br>91<br>92<br>81 | 01<br>91<br>93<br>81 | 01<br>91<br>94<br>81 | 01<br>91<br>95<br>81 | 01<br>91<br>96<br>81 | 01<br>91<br>97<br>81 | 01<br>91<br>98<br>81 | 01<br>91<br>99<br>81 | 01<br>91<br>9A<br>81 | 01<br>91<br>9B<br>81 | 01<br>91<br>9C<br>81 | 01<br>91<br>9D<br>81 | 01<br>91<br>9E<br>81 | 01<br>91<br>9F<br>81 | 01<br>91<br>A0<br>81 |

| | OUT 17 | OUT 18 | OUT 19 | OUT 20 | OUT 21 | OUT 22 | OUT 23 | OUT 24 | OUT 25 | OUT 26 | OUT 27 | OUT 28 | OUT 29 | OUT 30 | OUT 31 | OUT 32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **IN 18** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 | 92 |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 19** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 | 93 |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 20** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 | 94 |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 21** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 22** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 | 96 |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 23** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 | 97 |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 24** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 | 98 |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 25** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 | 99 |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 26** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A | 9A |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 27** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B | 9B |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 28** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C | 9C |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 29** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D | 9D |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 30** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E | 9E |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 31** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F | 9F |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |
| **IN 32** | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 | 01 |
| | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 | A0 |
| | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 9A | 9B | 9C | 9D | 9E | 9F | A0 |
| | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 | 81 |

## 11.2 ASCII Protocol: General

The ASCII protocol has three basic commands: **Y** *for connect*, **T** *for recall*, **P** *for store*. Before using the ASCII protocol, you need to select it from the machine's front panel. Press the MENU button until you get to "set communication protocol" and then choose the ASCII protocol. This is saved in the non-volatile memory, so the machine will remain as ASCII even after cycling power. To check that the protocol has been selected, and to confirm that the communication is OK, send the string **!! to the VS-3232Vxl. It should reply by sending the string OK!!

### 11.2.1 ASCII Protocol: Description

The three basic commands are **Y**, **T**, and **P**.

**"Y" command: MAKE A CROSSPOINT CONNECTION**. The format is:

**** Y o#, i# !!** where i# is the input number, and o# is the output number.

Note: The string does not need a space (spaces are used here just to add clarity to the explanation).

For example:

**Y3,4!! would connect input 4 to output 3

**Y9,6!! would connect input 6 to output 9

**Y2,17,Y25,12,Y7,6!! would connect input 17 to output 2, input 12 to output 25, and input 6 to output 7.

The buffer allows up to 63 characters. Thus you could place up to about 10 crosspoint connections in a single string.

Also:

**Y0,5!! would connect input 5 to all outputs

**Y3,0!! would disconnect output 3

**"T" command: RECALL A SETUP**. The format is:

**** T s# !!** where s# is the setup number (1 to 59) which is to be recalled.

For example:

**T13!! would recall setup number 13

**"P" command: STORE A SETUP**. The format is:

**** P s# !!** where s# is the setup number (up to 59) where the machine's present status is to be stored.

For example:

**P13!! would store in setup number 13

The reply for all commands could be:

OK!! or ERROR!!

**LIMITED WARRANTY**

Kramer Electronics (hereafter *Kramer*) warrants this product free from defects in material and workmanship under the following terms.

**HOW LONG IS THE WARRANTY**

Labor and parts are warranted for seven years from the date of the first customer purchase.

**WHO IS PROTECTED?**

Only the first purchase customer may enforce this warranty.

**WHAT IS COVERED AND WHAT IS NOT COVERED**

Except as below, this warranty covers all defects in material or workmanship in this product. The following are not covered by the warranty:

1. Any product which is not distributed by Kramer, or which is not purchased from an authorized Kramer dealer. If you are uncertain as to whether a dealer is authorized, please contact Kramer at one of the agents listed in the Web site www.kramerelectronics.com.
2. Any product, on which the serial number has been defaced, modified or removed.
3. Damage, deterioration or malfunction resulting from:
   i) Accident, misuse, abuse, neglect, fire, water, lightning or other acts of nature
   ii) Product modification, or failure to follow instructions supplied with the product
   iii) Repair or attempted repair by anyone not authorized by Kramer
   iv) Any shipment of the product (claims must be presented to the carrier)
   v) Removal or installation of the product
   vi) Any other cause, which does not relate to a product defect
   vii) Cartons, equipment enclosures, cables or accessories used in conjunction with the product

**WHAT WE WILL PAY FOR AND WHAT WE WILL NOT PAY FOR**

We will pay labor and material expenses for covered items. We will not pay for the following:

1. Removal or installations charges.
2. Costs of initial technical adjustments (set-up), including adjustment of user controls or programming. These costs are the responsibility of the Kramer dealer from whom the product was purchased.
3. Shipping charges.

**HOW YOU CAN GET WARRANTY SERVICE**

1. To obtain service on you product, you must take or ship it prepaid to any authorized Kramer service center.
2. Whenever warranty service is required, the original dated invoice (or a copy) must be presented as proof of warranty coverage, and should be included in any shipment of the product. Please also include in any mailing a contact name, company, address, and a description of the problem(s).
3. For the name of the nearest Kramer authorized service center, consult your authorized dealer.

**LIMITATION OF IMPLIED WARRANTIES**

All implied warranties, including warranties of merchantability and fitness for a particular purpose, are limited in duration to the length of this warranty.

**EXCLUSION OF DAMAGES**

The liability of Kramer for any effective products is limited to the repair or replacement of the product at our option. Kramer shall not be liable for:

1. Damage to other property caused by defects in this product, damages based upon inconvenience, loss of use of the product, loss of time, commercial loss; or:
2. Any other damages, whether incidental, consequential or otherwise. Some countries may not allow limitations on how long an implied warranty lasts and/or do not allow the exclusion or limitation of incidental or consequential damages, so the above limitations and exclusions may not apply to you.

This warranty gives you specific legal rights, and you may also have other rights, which vary from place to place.

**NOTE:** All products returned to Kramer for service must have prior approval. This may be obtained from your dealer.

This equipment has been tested to determine compliance with the requirements of:

| | |
|---|---|
| EN-50081: | "Electromagnetic compatibility (EMC); generic emission standard. Part 1: Residential, commercial and light industry" |
| EN-50082: | "Electromagnetic compatibility (EMC) generic immunity standard. Part 1: Residential, commercial and light industry environment". |
| CFR-47: | FCC Rules and Regulations: Part 15: "Radio frequency devices Subpart B Unintentional radiators" |

**CAUTION!**

- ⊠ Servicing the machines can only be done by an authorized Kramer technician. Any user who makes changes or modifications to the unit without the expressed approval of the manufacturer will void user authority to operate the equipment.
- ⊠ Use the supplied DC power supply to feed power to the machine.
- ⊠ Please use recommended interconnection cables to connect the machine to other components.

**For the latest information on our products and a list of Kramer distributors, visit our Web site: www.kramerelectronics.com, where updates to this user manual may be found.**
**We welcome your questions, comments and feedback.**

**Safety Warning**:
Disconnect the unit from the power supply before opening/servicing.

**Kramer Electronics, Ltd.**
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**P/N: 2900-000325 REV 2**